



FRIDAY, APRIL 10.

CONTENTS.

PAGE.	PAGE.
ILLUSTRATIONS:	
A Novel Fire Box..... 243	Personal..... 256
Oil Mixing Plant—Lehigh Valley R. R..... 244	Elections and Appointments..... 256
The Baker Car Heater..... 246	Railroad Construction..... 256
Pressed Steel in Wrecks..... 247	General Railroad News..... 258
Buckeye Car Coupler..... 248	Traffic..... 258
CONTRIBUTIONS:	
A Novel Fire Box..... 243	MISCELLANEOUS:
The Nuisance of Tunnels..... 248	Technical..... 258
EDITORIALS:	Railroad Law..... 254
Suggestions for the Committee on Safety Appliances..... 250	The Scrap Heap..... 253
The Railways and the Traders..... 250	Locomotives for New South Wales..... 243
EDITORIAL NOTES..... 250-251	The Baldwin Locomotive Works..... 246
New Publications..... 251	Texas Railroad Law..... 247
Trade Catalogues..... 252	Railroads in China..... 247
GENERAL NEWS:	The Time Convention Meeting..... 248
Locomotive Building..... 254	Shop Notes—Kings County Elevated..... 249
Car Building..... 254	Lake Erie & Ohio River Ship Canal..... 249
Bridge Building..... 254	Tunneling Under Heavy Pressures..... 252
Meetings and Announcements..... 255	

Contributions.

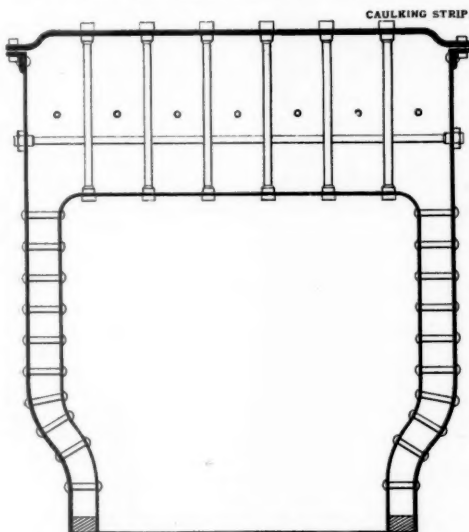
A Novel Fire Box.

CHINA, February 3, 1891.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have to thank you very much for your kind attention to my letter published in your number of Nov. 28, 1890.

I have recently designed a peculiar form fire box casing,



ing, as shown herewith, but I am not sure whether it has ever been tried before, or that it will come up to my expectations.

We are sadly troubled with extremely bad saline water, which cannot be treated except by distillation, obviously a most costly luxury. If the fire boxes could be cleaned and examined every six months I calculate they would have double the life. Now, in order to do this cheaply I propose to bring up the sides of the box to a level, putting a stout angle iron around the top. The surface of the angle iron will be planed and a caulking ring inserted between it and the "cover plate," which can be either flat, dished or corrugated. The stays are fitted with gun metal nuts outside, which can be readily removed and the top plate can be either bolted or riveted.

Possibly the life of the fire box will be increased by superior means of upward expansion given by the spring of the plate. The cover plate should be of stamped steel.

If feasible and economical the system is more especially adapted to large American boilers with narrow grates. The sketch shows the Belpaire type, but the system is easily adapted to any other. C. W. K.

The Nuisance of Tunnels.

TO THE EDITOR OF THE RAILROAD GAZETTE:

BOSTON, April 4, 1891.

The letter in the *Railroad Gazette* headed "The Responsibility for the Tunnel Disaster" is apt and to the point. A railroad tunnel always has been a most dangerous nuisance; their construction should be avoided, if possible. I have been much disgusted at the glib and thoughtless manner in which the press and legislators advocate the building of tunnels. They do not seem to consider the cost of construction and the danger of operation after they are finished. I am glad to see some one speak right out in meeting.

A. A. FOLSOM.

Locomotives for New South Wales.

The Baldwin Locomotive Works have just shipped 27 locomotives by steamship "Henley" to the government of New South Wales, Sydney. Of these 15 are light tramway locomotives, intended for passenger service on the tramways. The other 12 are heavy passenger locomotives, ten-wheel type, with three pairs of driving wheels and a four-wheel leading truck. They have separate eight-wheel tenders.

The general dimensions of these locomotives are as follows: Total weight in working order, exclusive of tender, about 125,000 lbs.; weight on forward truck, 28,000 lbs.; weight on driving wheels, 97,000 lbs.; approximate weight of tender, with full supply of coal and water, about 80,000 lbs.; cylinders, 21 in. diameter by 24 in. stroke; driving wheels, 61 in. diameter; gauge of track, 4 ft. 8½ in.; water capacity of tender, 3,600 gallons. The boilers are of steel, 62 in. diameter, with copper fireboxes, copper staybolts and brass tubes. They are covered with magnesia sectional lagging, similar to United States dynamite cruiser "Vesuvius" and other United States war vessels of recent construction.

The driving wheel centres are of wrought iron, forged by the process developed at the Baldwin works. The truck and tender wheels are steel-tired. The engine and tender are fitted with Westinghouse equalized-pressure driver brake fixtures, which are actuated by brake equipment supplied by the Westinghouse Air Brake Company, Limited, of London. As most of the locomotives on the New South Wales railroads are equipped with the English apparatus, it was thought best to preserve the uniformity. The driver and tender brakes can also be operated by powerful screw apparatus. The reversing gear is operated by a screw in accordance with the English practice. The locomotives are also equipped with United States metallic packing, Nathan sight-feed lubricators, special lubricators for oiling the driving boxes for high-speed service, and other latest improvements.

The service for which these engines are intended is described by the following extract from a letter from the Secretary for Railways: "The sharpest curve on our road is 528 ft. radius (nearly 11 degrees). The steepest grade is 176 ft. per mile. It is proposed to haul with this engine trains weighing 152 gross tons (340,500 lbs.) up long grades of 130 ft. per mile. This would be the usual train, and we expect it to be hauled up this grade at about 22 miles per hour. Occasionally the train would have an additional car, making the load, without engine and tender, 176 tons or 394,240 lbs. These loads include a full complement of passengers, mail and baggage. The cars are all on trucks or bogies.

"The regular load up the 176 ft. grades would be 120 gross tons (269,000 lbs.), without engine or tender. These grades are free from very sharp curves, and therefore in practice a greater proportionate load can be hauled than on the 130 ft. grades. It is, therefore, expected that occasionally an extra car could be handled, making the total weight of the train 144 gross tons (322,500 lbs.) without engine or tender."

The steamship "Henley" is due to arrive at Sydney about June 15. The Baldwin Works' engineer and representative, Mr. William Rhodes, will supervise the erection and trials of the locomotives in New South Wales.

The same works are also building, for shipment in May, 20 consolidation freight locomotives, 18 of which are to be simple, high-pressure engines, with 21 in. × 26 in. cylinders, and two are to be compound locomotives, with high-pressure cylinders 13½ in. × 26 in. and low-pressure cylinders 22 in. × 26 in.

Oil Mixing Plant—Lehigh Valley Railroad.

BY C. P. COLEMAN, CHEMIST, L. V. R. R.

I.

About six years ago Mr. H. Stanley Goodwin, General Eastern Superintendent, and Mr. Wm. C. Alderson, Treasurer and Purchasing Agent, Lehigh Valley Railroad, examined the subject of the feasibility of the railroad company establishing an oil mixing plant in order to reduce the cost of the oil used on the road for various purposes in connection with the motive power, shop, station and train service, and to offer better guarantees for a more uniform and reliable supply under the immediate control of the railroad company. The investigations and estimates made at that time with a view to erecting a plant indicated that the company could reduce the cost of its oil supply in one year sufficiently to pay the first cost of a complete oil mixing establishment, and it was decided to build such a plant. The first plans, prepared under the directions of Mr. J. S. Leutz, Superintendent car department, contemplated the erection of a small plant at Packerton, Pa., and mixing the oils in the mixing tanks by means of iron paddles on shafts operated by steam power. The limited space available at Packerton, and the fact that the crude stock would probably be bought chiefly in the eastern market, caused the works finally to be located at Perth Amboy, N. J., the designs being prepared and the construction carried out under the supervision of Mr. Walter G. Berg, Principal Assistant Engineer.

The method of mixing the oils by blowing air into the mixing tanks was adopted, as investigations showed that some of the principal manufacturers of lubricants in this country and abroad had introduced this process

with success and at less expense for the first cost of the plant and its subsequent operation. The works were enlarged over the original plan so as to create a first-class establishment in every respect, the space and facilities available at Perth Amboy offering no restrictions in designing the general layout. The works were completed in the fall of 1887 and placed in charge of Mr. Charles P. Coleman, chemist, L. V. R. R., under whose management the original expectations as to the financial saving to the company have been realized.

The financial success of these works, combined with the efficient design and the systematic, scientific and practical methods adopted for the manufacture of the oils and their distribution along the road, warrant us in giving a full description of the construction and operation of the plant, with extracts from the specifications governing the purchase, manufacture, and use of the oils and the testing of same, in connection with a description of the chemical laboratory.

CONSTRUCTION.

The location of the oil-mixing works is at the coal and freight terminal of the Lehigh Valley railroad, at Perth Amboy, N. J., adjoining the creosoting works of the same company, the boilers at the creosoting works supplying steam to the oil works. The general layout, as shown in fig. 1, consists of the oil mixing house proper, the tank car discharging house and the storage shed, located some distance away from the mixing house. Two tracks run into the works, and ample yard space is provided for the storage of surplus stock, empty barrels and sundry supplies.

The crude oils or stock not requiring to be mixed, when received at the works in barrels, are stored in the storage shed until shipped off or needed in the oil-mixing house. Oil arriving in tank cars is discharged by gravity from the tank-car discharging house into the large storage tanks in the basement annex to the oil-mixing house.

The oil-mixing house consists of a barrel storage room and a discharge and supply room on an upper level, with a basement annex consisting of three rooms, respectively, the mixing room, the storage tank room for crude stock, and the engine-room. The main working room, the discharge and supply room, on the upper level, serves for dumping the barrel crude stock and tallow into the mixing tanks in the basement. It is also utilized to store the mixed oils in supply tanks located along one side of the room, from which the mixed oils are drawn into barrels for shipment over the road.

The storage shed is a one-story frame structure, 100 ft. × 38 ft., divided into two rooms, the one for storage of oils in barrels and the other for storage of waste in bales. A loading platform runs along a track on one side of the house, and barrel skids along the platform facilitate the transfer of barrels between the storage shed and the oil-mixing house. The floor of the shed consists of plank on mud-sills. The building is sheathed and roofed with corrugated galvanized iron on a wooden frame. The roof trusses are spaced 10 ft. centres. The height from floor to truss is 12 ft. in clear.

The tank car discharging house, shown in figs. 2 and 3, is a one-story frame shed, 20 ft. × 45 ft., sheathed and roofed with corrugated galvanized iron. This house serves in winter to heat heavy or congealed oils arriving in tank cars till the oil gains the proper fluidity, so as to be discharged into the storage tanks in the adjoining basement. The cars are run into the house, the doors closed and steam turned into steam coils along the walls of the building. This building obviates the objectionable features of inserting a steam pipe into the tank cars and discharging live steam into the congealed oil, and it offers a less cumbersome method than the system of placing horseshoe-shaped steam coils over the tank cars.

The oil-mixing house, shown in figs. 2, 3, 4 and 5, consists of a one-story brick building, 33 ft. × 71 ft. 6 in., on stone foundations, with double-pitched iron roof covered with corrugated galvanized iron, divided by a brick partition wall into the barrel storage room, 35 ft. 6 in. × 38 ft. 6 in. in the clear and the discharge and supply room, 35 ft. 6 in. × 38 ft. 6 in. in the clear. The basement annex is a brick and stone structure, roofed with a flat roof, covered with a layer of cement, tar and gravel, on 4-in. flat brick arches sprung between 6 in. I beams, spaced 3 ft. centres and spanning 11 ft., supported at their ends on the walls or on a 12 in. I-beam on 8 in. cast iron columns. The basement has three rooms, respectively, the mixing room, 12 ft. 6 in. × 32 ft. in the clear, the storage tank room for crude stock, 22 ft. × 35 ft. in the clear, and the engine room 6 ft. × 24 ft. in the clear. The clear height of the upper rooms is 12 ft. 6 in.; the clear height of the basement varies from 8 ft. at the low end to 12 ft. at the high end. The engine room is connected with the supply and discharge room by stone steps, walled over with brick and provided with iron doors at top and bottom. The upper floor is 12 ft. 6 in. higher than the floor in the basement and 4 ft. above the track that runs along the 8-ft. loading platform on one side of the house. All the brick walls in the building are 13 in. thick, to afford greater stability and safety to the structure in case of fire. The iron roof trusses over the main building, spanning 37 ft. between centres of walls, are spaced 10 ft. centres. They are pin-connected and built of angle-iron principal rafters, star-iron struts, round-iron tie rods, and angle-iron purlins, spaced 5 ft. 6 in., and covered with No. 20 gauge corrugated galvanized iron fastened to the purlins

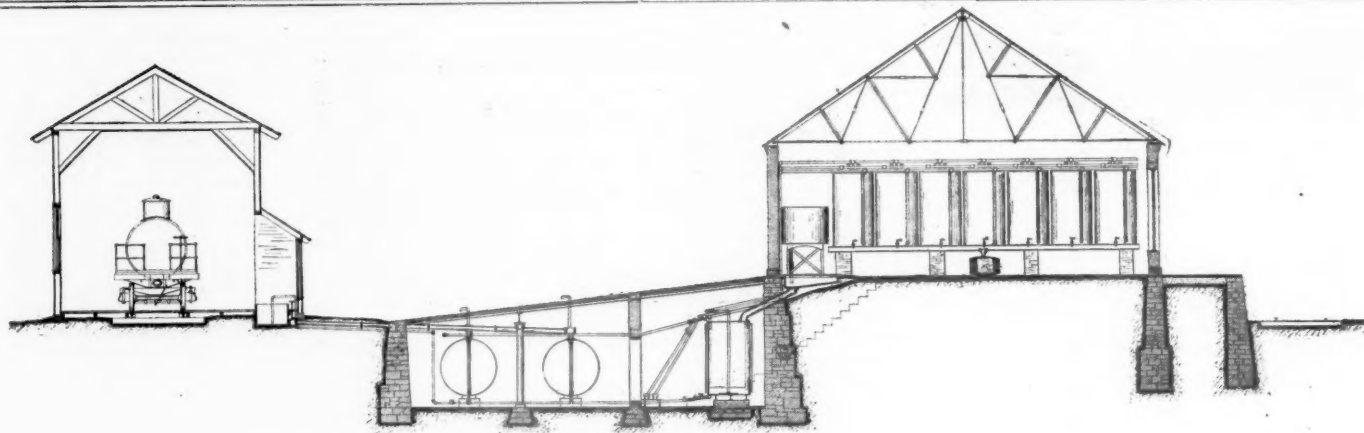


Fig. 2.

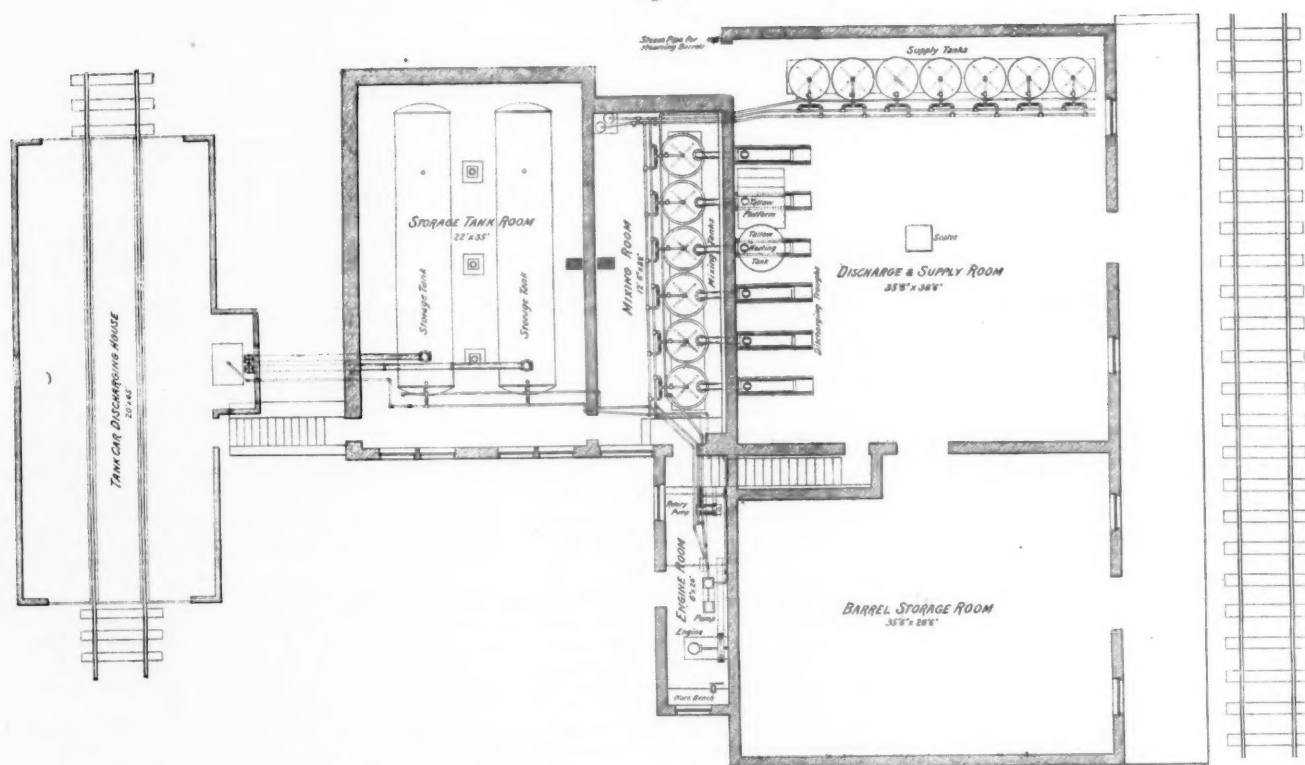


Fig. 3.

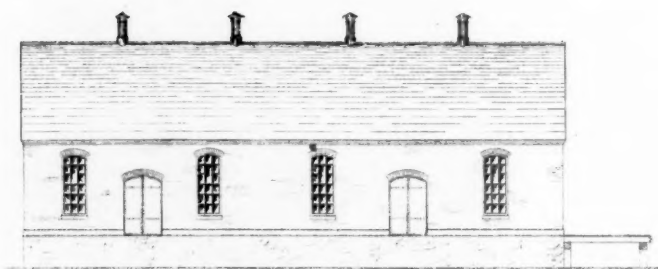


Fig. 4.

with flat hoop iron bands. The door and door frames throughout the house are wrought iron and the door sills are cast iron. All window frames and sash, including the mullions, are cast iron. All windows are provided with cast iron shutters. All sashes are fixed throughout the house, but there are two lights in each window hung in a cast iron pivoting sash set in between the cast iron mullions of the main sash. In addition to these openings in the sash, ventilators are provided, as shown on the plans. The sash in the mixing-room and storage tank room are bolted into the window frames in such a way as to be readily removed to allow tanks to be taken through the window openings in case of repairs or renewals being required. The floor of the loading platform of the barrel storage room is made of stone slabs, the floor of the discharge and supply room of brick laid flat, and the floor in the basement of cement dished toward suitable sinkholes connecting with drain pipes.

There are seven supply tanks 4 ft. in diameter, by 7 ft. high, for the storage of mixed oils, placed on a raised platform on one side of the discharge and supply room. The platform is built of 6-in. I-beams on brick piers. The tanks are built of $\frac{1}{2}$ -in. iron and covered on top, and have faucets with copper wire basket strainers, glass gauge tubes and cast iron drip boxes on the floor under the faucets. Each tank holds 625 gallons.

On the side of the discharge and supply room, next to the mixing-room, there are six cast iron box troughs set in the floor, connected by a 6-in. pipe passing through the stone foundation wall of the main building, with the

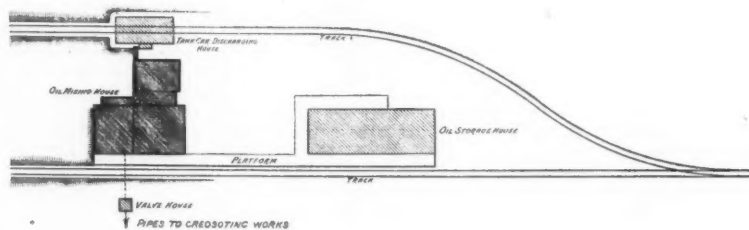


Fig. 1.

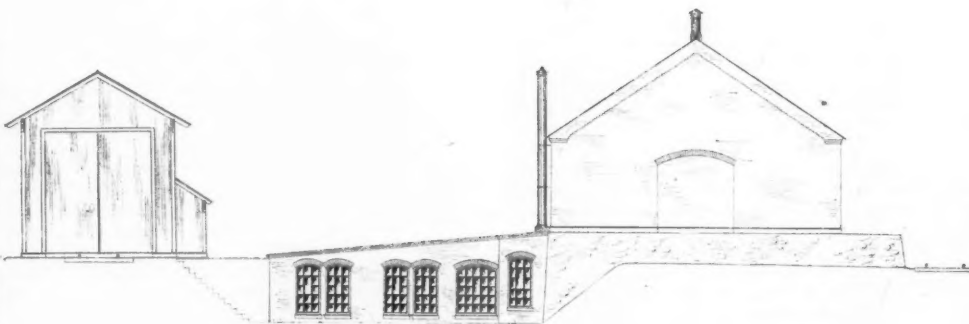


Fig. 5.

OIL-MIXING PLANT.—LEHIGH VALLEY RAILROAD.

top of the mixing tanks in the basement. The sides of these troughs are raised a few inches above the floor, so as to form skids for the barrels to rest on when being dumped. The opening at the end of the trough leading into the 6-in. pipe is covered with wire netting and kept closed, when not in use, by a heavy cast iron hinged cover. Each trough is 12 in. wide by 5 ft. long, and from 6 in. to 10 in. deep.

In the mixing room in the basement there are four mixing tanks at present (space being left for two more, if ever, required) set on a stone bench raised 1 ft. above the

floor of the basement. Each mixing tank is 4 ft. in diameter and 7 ft. high, built of $\frac{1}{4}$ -in. iron, covered on top, and surrounded by a steam jacket built of $\frac{3}{8}$ -in. iron. The capacity of each mixing tank is 625 gallons.

In the storage tank room there are two cylindrical tanks, similar to tanks on tank cars, each 5 ft. 6 in. in diameter and 27 ft. long, with a capacity of 4,680 gallons. The tanks are built of $\frac{1}{2}$ -in. iron and set on cast iron saddles on the top of the floor.

In the engine room there are a vertical engine, a rotary blower and a steam pump. The engine is of the

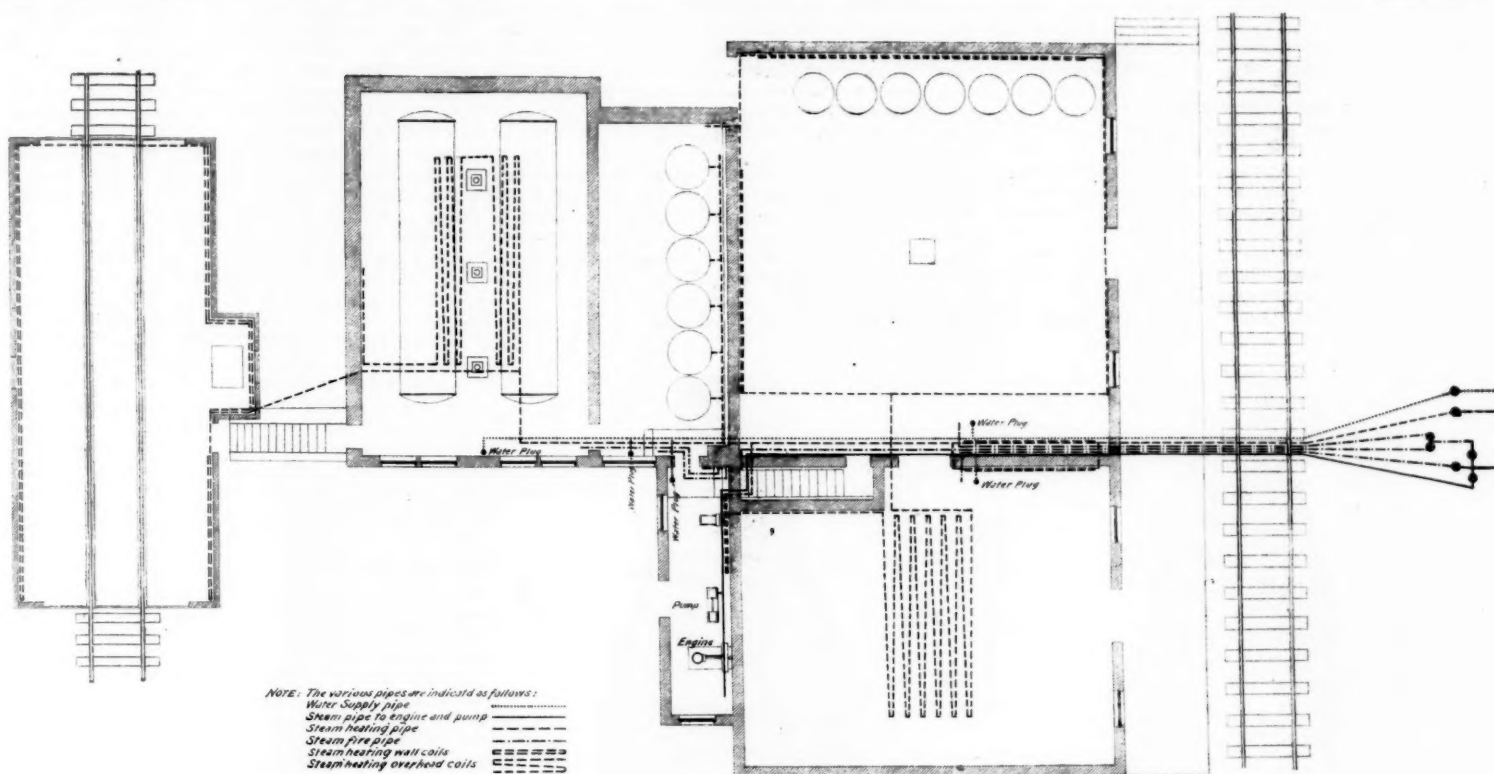


Fig. 6.

OIL-MIXING PLANT.—LEHIGH VALLEY RAILROAD.

New York Safety Steam Power Co's make, and is supplied with steam through a two-inch pipe connected with the main steam pipe from the boilers of the creosoting works adjacent to the oil works, as explained above. It has a 7 in. \times 9 in. cylinder and a nominal capacity of 10 H. P. The engine drives the rotary blower by means of a 42 in. flywheel and belting. The rotary blower is of the Wilbraham Bros. (size C.) make and serves not only to mix the oils in the mixing tanks by blowing air into the tanks near the bottom of the tanks, thereby causing the contents of the tank to be thoroughly agitated, but it serves also as an oil pump.

The suction is 2 in. in diameter, arranged to work on the oil pipes or to draw in air, and the discharge pipe is 2 in. in diameter, connecting with the blow-pipes to the tanks or with the oil pipes. In addition to the blower there is an ordinary steam pump for transferring oils, supplied with steam through a 1-in. steam pipe. This pump is of Guild & Garrison's make, and has a 6-in. \times 7-in. steam cylinder and a 3½-in. \times 10-in. oil cylinder, with a 2-in. suction and a 2-in. discharge pipe.

The pipe system, shown in figs. 2 and 3, consists of blow pipes from the blower to the mixing tanks in the basement and to the supply tanks in the discharge and supply room, in the first case to mix the oils and in the latter case to agitate the mixed oils slightly from time to time to prevent the ingredients separating to a more or less extent according to their specific gravities, if allowed to stand undisturbed for quite a time. The blow pipe in each tank extends to within a few inches of the bottom of the tank, where it branches into four short horizontal perforated 1-in. pipes. The oil pipe system consists of suction pipes from the large storage tanks in the basement to the pumps, and discharge pipes from the latter to the mixing tanks to allow crude stock from the storage tanks to be transferred to the mixing tanks. There are also suction pipes from the mixing tanks to the pumps to allow the mixed oils to be pumped up through delivery pipes to the supply tanks in the discharge and supply room. There is also a delivery pipe from the pumps to the storage tanks, in case oil is to be transferred from the mixing tanks or the supply tanks to the storage tanks. There is no special suction pipe, however, provided in the supply tanks, as the blowpipe entering the same can be used as suction pipe in connection with the rotary pump for transfer of oils from the supply tanks to the different tanks in the basement, which operation is seldom required. There is also a suction pipe extending to the tank car discharging house, so that oils can be pumped directly from the discharge box alongside the cars through the pumps, in place of being discharged by gravity to the storage tanks, which, under certain contingencies, might be found desirable. As previously explained, the blower can be used as a rotary pump to transfer oil, and the various suction and delivery pipes are connected in such a way with the blower and the regular oil pump that either one or the other can be operated on any of the oil pipes.

The system of delivery pipes leading from the pumps to the mixing tanks and to the supply tanks, and the suction pipes leading from the mixing tanks to the pumps, is double, so as to enable the light-colored oils to be kept separate from the dark-colored oils, the one line

being used exclusively for one class of oils and the other line for the other class. Except in cases of breakdowns, the rotary pump is used exclusively for light-colored oils and the regular oil pump for dark or heavy oils, which, when slightly congealed, require considerable power to force them through the pipes. The pipes are all inclined, as much as possible, in such a way as to allow them to free themselves by gravity when pumping is stopped. At all low dead ends drain cocks are provided and any oil left in the pipes after dumping is drained off into the buckets before another grade of oil is pumped through the same pipe. In this manner the adulteration of one grade of oil by coming in contact in the pipes or pumps with remnants of another grade of oil is reduced to the least possible limit. The suction pipe and the delivery pipe between the storage tanks in the basement and the pumps are single, as only dark oils pass through them. The blowpipes are 1½ in. in diameter and the oil pipes are 2 in. in diameter.

The heating of the house and the mixing tanks is done by superheated steam, supplied from the superheater at the adjacent creosoting works. As shown in fig. 6, there are coils in the discharge and supply room back of the supply tanks, the number being larger back of the tanks for heavy oils than for light oils. There are also coils along the wall next to the dumping troughs and on the partition next to the storage room; as barrels prior to being dumped are brought in from the storage room and placed along this partition the oil is fluid enough to discharge easily. The temperature of the discharge and supply room is generally kept at about 70 deg. Fahr. In the barrel storage-room the temperature is maintained at about 70 degrees Fahr. by means of coils hung from the trusses overhead, and by a set of coils along the partition next to the discharge and supply room, the aim being to gradually heat the oils as they are transferred from the general stock in the storage-room till ready to discharge into the dumping troughs. The general temperature of the oil-mixing room does not require to be over 70 degrees Fahr., but it is usually 110 degrees when working, due to the large amount of heat thrown off by the steam jackets around the mixing tanks. The tank storage room in the basement is heated by a set of coils hung from the roof over the tanks, the temperature being kept at about 70 degrees Fahr. The pipes of the steam coils are 1½ in. in diameter.

The house is lighted throughout by incandescent lights supplied from the electric light plant of the railroad company at the Perth Amboy terminal.

The provisions for protection against fire, as shown in fig. 6, are particularly noteworthy in this design, and have been carried out with great care and forethought. The idea of isolating the basement annex from the main body of the house and the distribution of the oil stock to different rooms and buildings, so as to limit the spread of fire as far as possible, has been conscientiously carried out. In every room there is a 1½ in. water-pipe with about 25 ft. of hose attached ready for immediate service, the water being controlled by a valve on the wall next to the hose connection. In addition small portable chemical fire-extinguishers are placed on shelves in different parts of the building. In case a fire cannot be brought under control by the water hose or the chemical apparatus, then the introduction of live

steam into the room is employed to smother the fire; for this purpose there leads into each room a separate 1½-in. steam pipe with an open end in the room, so that live steam can be turned into any of these rooms from the valvehouse outside of the main building. To prevent the escape of the steam and to prevent the entrance of air, as also to retard the spread of a fire, all door openings and passages have iron doors, the windows are provided with iron shutters, and all ventilators have dampers which can be closed from the outside of the house. In addition there are several hundred feet of 2½-in. fire hose in the valvehouse near the works. To prevent the large closed storage tanks in the basement from exploding in case of fire, overflow or relief pipes are provided, which project above the shed roof over the tanks and serve to relieve any undue pressure that might be caused in the tanks by extreme heat.

After the works had been in operation for some time it was found that tallow could not be heated sufficiently, when dumping in the dumping troughs, to run freely into the mixing tanks, and that with steam jackets around the mixing tanks the tallow was not heated uniformly throughout the tank. The arrangement, shown in figs. 2 and 3, was therefore introduced over one of the troughs leading to that one of the mixing tanks in which tallow is used as one of the ingredients, consisting of a raised table on which the cask of tallow is rolled, the staves broken, and the tallow shoveled into a wrought-iron open tank alongside the table and immediately over the dumping trough. This tank has steam coils inside of it, and as the tallow melts it drains through a pipe, and wire strainer, into the dumping trough, and reaches the oil-mixing tank in a fluid state. As the table and heating tank straddle dumping troughs, the discharging of barrels beneath them is not interfered with.

The following suggestions are offered as desirable improvements in the plant, brought out by the experience gained in the operation of the works: It has been proved that steam jackets do not heat the contents of the mixing tanks uniformly, and steam coils inside the tanks would be an improvement if kept steam tight. The tanks in use at present were originally ordered for the house designed for Packerton. The storage tanks in the basement should be larger, so as to hold about 8,000 galls., as the capacity of some tank cars arriving at the works is over 6,000 galls. The addition of one or two large storage tanks would be an improvement, as it would allow a larger amount of crude oil to be kept in stock, and the operation of the works would not be so liable to interruptions caused by delay in the delivery of crude stock. A cooperage shed with the necessary appliances and steam pipes or steam chests for the steaming, cleaning and repairing of empty barrels would be a desirable addition in a new layout, as at present the barrels have to be steamed by a short steam pipe connection, and the repairing done in the open yard back of the house. The difference in the floor levels of the main house and the basement should be increased so as to allow of heavier grades in the pipes to facilitate their drainage after pumping. This also applies to the discharge pipes from the tank-car discharging-house. The engine-room should be larger, so as to give more room for the work bench and better facilities for making light

repairs. In a new design the disposition of the tallow-heating tank could be advantageously changed, so as to form a component part of the plan. With these modifications the buildings and plant can be considered as first class.

The Baker Car Heater.

Some of the latest improvements in the Baker heater are shown in the accompanying engravings. Fig. 1 is an exterior view, and fig. 2 a section of what is called the "jointless, fireproof, Baker car-heater."

The fire is enclosed by the generator coil, through which the water flows, which is surrounded by the iron case, and the whole is enclosed in a cylinder of seamless, soft steel, $\frac{1}{4}$ -in. thick, with tensile strength of 60,000 lbs.

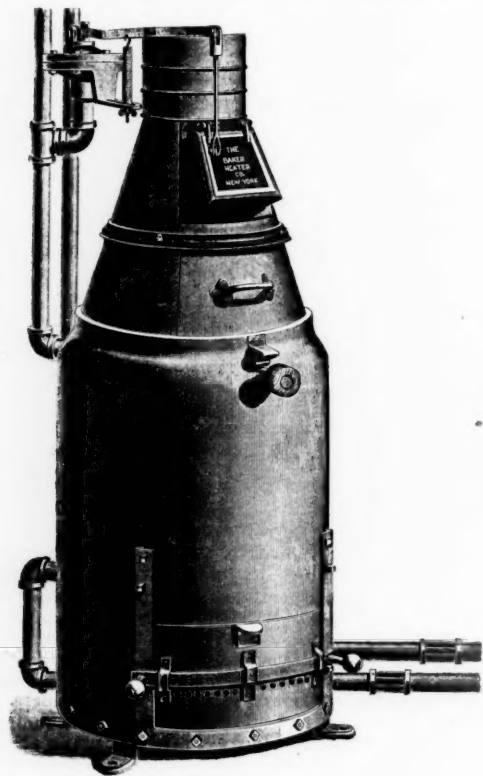


Fig. 1.

THE BAKER CAR HEATER.

Between the iron casing and the external steel case are inserted sheets of asbestos. The smoke and gases escape through the perforated plate shown over the firepot. The feed opening in this plate is closed by the safety plate, as it is called. This is drawn out by the wooden knob shown externally in fig. 1. It is held fast in position, when closed, by the spring shown above the shank, in the same figure. The cleaning door, shown below, is also securely fastened. The fire so enclosed can hardly be a source of danger.

The vertical pipes shown in fig. 1 rise to a wrought iron, jointless drum, or water reservoir, which has a safety vent and is provided also with a filling funnel. These pipes carry the pressure gauge. The drum can be placed outside the car if desired. It is tested to stand a pressure of 2,000 lbs. per sq. in.

The generator coil shown in fig. 3 and also in the sectional view is the latest novelty.



Fig. 3.

The pipe increases in diameter from $1\frac{1}{4}$ in. to $2\frac{1}{4}$ in., in order to provide for the expansion of the water as it is heated. It is said that by this arrangement the circulation is greatly quickened; in fact, it takes about one-half the time for the water to make the circuit that is taken with the old style coil of uniform diameter.

The draft is controlled by the regulator shown in fig. 1. This consists of two concave plates, enclosing a corrugated steel diaphragm. This diaphragm is connected with a piston, which in turn connects with a lever attached to the damper. A spiral adjusting spring is also shown; the figures on the lever denote the pressure within the heater.

The new pressure safety vent is shown in fig. 4. It is a single piece of hollow cast iron, the top of which is turned to a uniform thickness of $\frac{1}{8}$ in. This top is the frangible portion of the vent, which is blown out before a dangerous pressure is reached. The vent is screwed into the top of the wrought iron circulating drum. In case a vent is blown off, a new one can be very easily screwed on. It is said that thousands of these have been used for the past five years, and that they are fast

superseding the old and unreliable rubber ball vent, as they cannot be screwed down or tampered with in any way. The vent is tested to 200 lbs., and will burst at about 350 lbs. gauge pressure. The piping is tested to 2,000 lbs. per sq. in. This vent is sold for \$2.75, without the bushing and pipe, so that a breakage of it is of small importance. It is stipulated that it must be placed outside the car roof.

There are points in which the Baker heater has obvious advantages over continuous heating by steam from the locomotive, and the safety of the apparatus which is illustrated here must be apparent to any unprejudiced mind. Nevertheless, the company supplies a system for heating the water in the Baker heater by steam from the locomotive, instead of fire, if this is desired.

Very complete and careful descriptions of the various

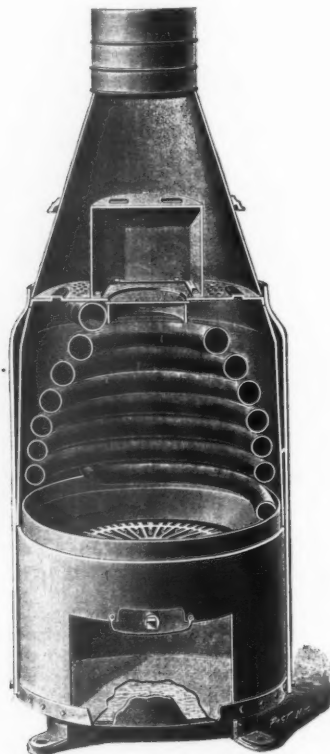


Fig. 2.

apparatus furnished by the company are contained in a catalogue which has recently been published. There are some interesting statements in the catalogue. It is admitted that the original Baker heater is not adapted to modern cars, partly from its limited capacity. "The

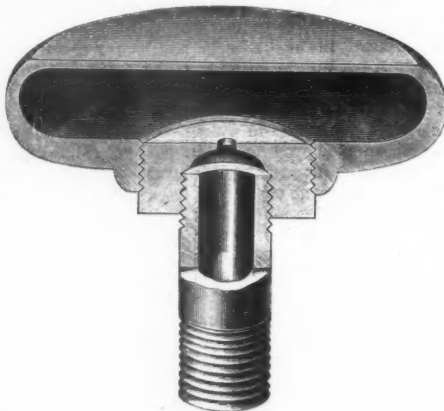


Fig. 4.

safety valve, which was the best thing Mr. Baker could originally invent, and which was tolerably reliable then, is utterly unreliable and positively dangerous now on the heater that must be forced far beyond its capacity, in the efforts to do double the duty that it was intended for." The new safety vent which is described above is valuable not only for its primary object, but is a check on carelessness. A call for a new vent is a proof that the water has been allowed to get low or freeze.

The Baldwin Locomotive Works.

Those who have not known the recent changes in the Baldwin Locomotive Works can hardly realize the vastness of that establishment. The present normal capacity is 1,200 locomotives a year, and the emergency capacity is greater than this. During the month of March, up to the 20th, 110 engines had been shipped. Four thousand eight hundred men are now employed during the day and 800 men at night, and 5,000 may be taken as the normal capacity. The working force has been reduced by about 300 men since the completion of the new erecting shop, owing to the better facilities for handling mate-

rial and the increase of space per engine on the floor. This shop was described in the *Railroad Gazette*, Aug. 22, 1890. Its construction was begun on July 15. At that time 76 houses were standing where the shop now is, and people were living there. On Oct. 1 of the same year, the shop was completed and engines were in process of erection on the floor.

This erecting shop is the largest in the world, and has room for 76 locomotives at one time. There are 19 tracks, with a capacity of 4 engines each. The 100-ton traveling cranes travel 2,200 ft. a minute when necessary to facilitate work. To prevent delays in testing locomotives before shipment, there is a battery of boilers in one corner of this shop which carry 250 lbs. pressure, and from which the locomotives to be tested are supplied with steam.

In each of the individual shops of these works the visitor will find novelties in tools and methods. In the link motion department there are many special tools of such nature as to enable the separate parts to be made independently, without fear of "misfits." The principle of duplicate parts and interchangeability has long been prominent at the Baldwin works. They were leaders in the movement toward duplicate parts and taper bolts years ago, and all additions of tools since that time have been made with the end of exact interchangeability in view. It is interesting to know the deterioration of tools in such a works as this, where tools are used to their utmost capacity during long periods, and where the natural developments soon cause many tools to become antiquated. At this date 10 per cent. annual deterioration is a fair average for all tools at these works.

In the machine shops there are several tools which are worth more than a passing notice. The grinder for guides is placed alongside the hydraulic straightener. With these tools two men can do more good work in truing up and straightening wrought-iron, case-hardened guides, than can be done by six men with the ordinary apparatus. The solidity of the grinder insures absolute accuracy of surface, an uncommon trait in large grinders. The quick-acting, powerful hydraulic straightener will remove a kink in a hardened guide in less time than it takes to prepare the blocking for the ordinary presses.

The frame slotters are run at these works in a manner that is considered by some builders as impracticable. Ordinarily but two frames are slotted at one time, but here six are placed at one setting and all are slotted at once, with a manifest saving in time and labor. A new slotter now ordered will have a sufficient height under the heads to receive eight frames, and on it this number will be finished at once. It will have a greater capacity than any other tool ever used for the purpose. Only two heads will be used as the third head commonly used in Europe, and in some works in this country, is found to be of little use on ordinary frames, and to be an obstruction when it cannot be used. It generally takes two men for three heads, while one man can care for two if the third one is removed.

In the boiler shop a new 17-ft. stake riveter is being placed. It has not a "plate closer," as it is rightly deemed better to fit up the sheets so that they will be in contact all around when taken to the riveter rather than to attempt to draw them together by a "closer," which, after all, can do but little to remedy bad fitting with thick sheets. This new riveter is adapted to drive $1\frac{1}{4}$ -in. rivets. This size of rivet is not uncommon at these works. This is evident from the fact that they are building a locomotive boiler 74 in. in diameter.

In the hammer shop a new furnace is being built for making larger sizes of wrought iron drivers. These drivers are made by wedging in proper position special rolled shapes of high grade wrought iron, bent to conform in general to the shape of the spokes, rim and hubs; after which they are heated to a welding heat and placed in dies under a steam hammer. Such is the certainty with which this process is now handled that all wheels are practically free from defects of any sort, and sections of the wheels cut out on a slotter show a continuous and perfect weld.

The Vaucrain four-cylinder, compound type of locomotive is being built in considerable numbers; 12 have been shipped and 12 more are under construction. Orders for these engines are now coming in unsolicited. Two are building for New South Wales. They are not all of one type, but are large and small, as engines run at these works, and that means a wide variation as one will generally find on the floor of the erecting shop locomotives from 18-in. gauge, with a hauling capacity about equal to a pair of good draft horses, to those with 24-in. cylinders and 74-in. boilers equal to generating 1,200 to 1,400 horse-power continuously.

Curiosities will always be found in a large locomotive works, and the Baldwin works is no exception, for they are in business to build engines, and will build anything that can be built, provided there is money to pay for it. So it happens that there are engines with cranks on axles outside of the frames, and with the frames outside of the wheels. Odd as these engines look, there is good sense in the design, as they are narrow gauge and such arrangement gives room for the link motion and other parts that are generally so crowded as to prevent good designing.

The "Swinerton" driving wheel, with facets on its tires, is being put on one of the order for five Class K Forney engines for the Manhattan Elevated road. The facets are about 1-in. face, and are scarcely percept-

ible to the touch. These engines have steel frames made all in one piece, of a slab of wrought steel, and are cut out of this solid block by drilling and slotting. The object of this is to reduce the breakage common with the wrought-iron frames now used without increasing the total weight. For the same reason these engines all have the wrought-iron drivers. The most extensive trial of this wrought wheel to be soon made in this country is on 20 ten-wheel engines for the Erie. Many foreign engines, more particularly those for South America, have copper stay bolts in the fire boxes. Wrought-iron pistons, either with double plates or single are common for some roads and there is reason to believe that they are decidedly a step in advance, as the weight of the reciprocating parts is much reduced by their use and there is less liability of breakage. Wrought-iron boiler fronts are made when desired. The design is such as not to require flanging and they are neater and lighter than the cast-iron design.

The majority of the boilers built now by these works have radial stays, and there have been no complaints from their use, but, to the contrary, their superior steaming and freedom from scale make them a favorite type with master mechanics who are bothered with bad feed-waters.

In accordance with the most progressive modern ideas of running large works this company has provided a restaurant and reading and card rooms for the men, all of which are under the charge of an executive committee selected by the workmen from their own foremen. The menu provides a course dinner for 15, 20 and 25 cents, according to the wants and means of the individual. The dishes for the money are rather remarkable. For the officers, a lunch room is provided on the top floor of the office building, and a smoking and lounging room will soon be added.

Additions have been recently made to the drawing-room and main office which add materially to the room available for desks and drawing-boards. Sixty draftsmen constitute the regular working force.

Texas Railroad Law.

Following is a condensed summary of the principal features of the bill which has recently become a law in Texas:

Section 1 provides for the appointment by the Governor of three commissioners at \$4,000 each per year. The term is one year. A commissioner must be not less than 25 years old, must hold no other office and engage in no occupation inconsistent with his duties. Section 2 directs the commissioners to meet at Austin and elect one of their number chairman, appoint a secretary at not over \$2,000 and two clerks at \$1,500 each per annum. They may also employ necessary experts. The commissioners may meet at any place in the state where necessary. Section 3 makes it the duty of the commission to establish rates and tariffs, and gives it power to correct abuses, discrimination and extortion. The commission must make a classification for freight and establish rates for it. The commission has the power to fix joint rates for freight over two or more roads and shall decide upon division of through rates where connections fail to agree. The commission shall make rates for the "transportation of loaded or empty cars," which apparently means mileage, and may also make rates for storage and demurrage; shall establish rates for passengers, not higher than those fixed by law; and may prescribe rates for any service performed by a railroad. Section 4 provides that ten days' notice of a hearing must be given the roads before establishing rates. The commission shall enforce the attendance of witnesses the same as is done by courts, and may punish for contempt. In complaints by shippers, etc., the rates established by the commission shall be deemed prima facie just. Aggrieved parties may file a petition in the courts of Travis county against the commission as defendant and such cases shall have precedence on the docket. Either party may appeal and such appeal shall have precedence in the Appellate Court. Sec. 5. The burden of proof in these cases shall rest on the plaintiff. Tariffs when established, must be furnished the companies and must be by them posted, in pica type. Sec. 6. Ordinary complaints from persons, firms or associations must be heard by the commission after five days' notice to the roads complained of. If a violation of law is proved, the commission shall determine if the same was wilful. If it was, the roads must make satisfaction and must pay the cost of investigation; if this is done, there shall be no prosecution by the state. The commissioners and their agents may inspect the books and papers of railroads at any time. Officers refusing to comply with a demand under this section shall be deemed guilty of a misdemeanor.

Section 11 directs the commissioners to ascertain the cost and capital and about everything else in the line of information about the roads of the state and the facts ascertained must "from time to time" be printed in the annual report. Sec. 12. The commission shall prepare blanks for reports from the roads and they must be filled out within 30 days; officers refusing shall be guilty of misdemeanor. The commission may prescribe a system of bookkeeping for the roads. It must investigate interstate rates and notify the Interstate Commerce Commission of irregularities discovered. Section 13 provides for paying witnesses outside their own county \$1 a day and three cents mileage each way. Railroad men are however excluded from the benefits of this. Witnesses riding free shall not receive mileage. Sec. 14. Any road or officer charging more than tariff rates shall be deemed guilty of extortion under penalty of \$100 to \$500, payable to the state. Section 15. Payment of rebates, drawbacks, etc., makes the person paying guilty of unjust discrimination, which is prohibited. Undue or unreasonable preference, etc., is prohibited. Connections must be treated fairly, provided, however, that perishable freight and live stock shall take precedence over other shipments. Charging more for a short haul for a long haul over the same line (direction not specified) is made unjust discrimination, but upon application to the commissioners this regulation may be suspended in special cases. This section shall not prevent the commission making group rates. Free transportation for charitable purposes, for the Government, etc., is authorized, and nothing in this section shall

prevent giving free transportation to railroad officers, agents, employees, stockholders or directors, or any person not prohibited by law.

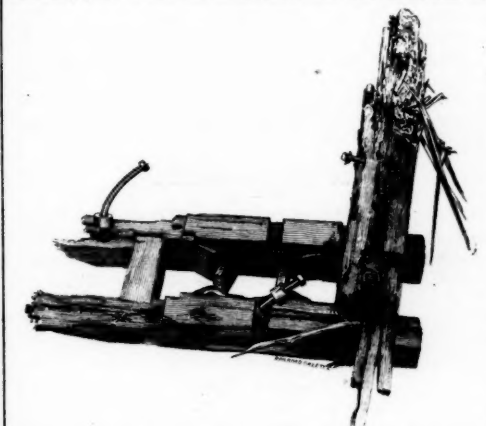
Section 16 provides a penalty of \$100 to \$1,000 for false billing etc., by any officer or agent of any railroad. Section 17 makes railroads liable to the aggrieved for anything it permits to be done in violation of this act, and in addition to settling the actual damage the road shall pay to the aggrieved a penalty of from \$125 to \$500. All penalties except those in Section 17 shall be sued for by the Attorney-General or under his direction and the attorney bringing the suits shall receive \$50 for each penalty and 10 per cent of the amount collected. Section 21 makes it the duty of the commissioners to see that the laws are enforced. Contracts between railroads for joint business must be submitted to the commission for examination and approval and when so approved shall be binding. This law shall not be applied to suburban belt lines in or near cities or towns. It shall be the duty of the commissioners to see that every passenger railroad runs at least one train a day, Sundays excepted, for passengers, and the commission shall have no power to relax this provision.

Pressed Steel in Wrecks.

A practical demonstration of the advantage of pressed steel in car construction is seen in the engravings here given. The illustrations are reductions from photographs taken of a wreck caused by a collision at Ridgway, Pa., Dec. 14,



1890, on the line of the Buffalo, Rochester & Pittsburgh Railroad. The car, which was of 30 tons capacity, and nearly new, was the second from the engine and was totally destroyed. The car in front was also completely crushed, and the tender was practically destroyed. About the only part of the car uninjured was the drawbar at-



tachment made of pressed steel by the Schoen Manufacturing Company. This was intact. The steel centre plates were bent and the bottom of the plate torn by the centre bolt. These were repaired in the blacksmith's shop at a slight expense. This was as severe a physical test as pressed steel could be subjected to in service, and clearly demonstrates some of the advantages of substituting it for cast iron, wherever practicable, in rolling stock.

Railroads in China.

One of the recent "Selected Papers" issued by the Institution of Civil Engineers (London) is "Railways and Collieries in North China," by Mr. Claude William Kinder, Member of the Institution, and Chief Engineer and Superintendent of the China Railway Co. The articles which we have published from time to time in the last four years, particularly the one in our issue of July 13, 1888, have contained much of the information which is incorporated in this pamphlet by Mr. Kinder. He gives, however, particulars which have not heretofore been made public, so far as we have seen, and the paper is not only interesting in itself, but important, as summing up in a convenient and logical way the railroad history and outlook of China.

The first railroad, the Woosung line, was built in 1876 and torn up by the Chinese in 1877. This was of 2 ft. 6 in. gauge. In later years when the present line was begun, the remains of this earlier narrow gauge road threatened to be the cause of serious injury to the railroad system of China, inasmuch as there was a very strong pressure made to have the old engines and rolling stock used,

which would have been a misfortune, in that it would have fixed the gauge at 2½ ft.

While the Viceroy of Nankin was pulling up the Woosung line, the Viceroy of the Northern Provinces, Li Hung Chang, was arranging with the manager of the China Merchants' Steam Navigation Company for opening a colliery to supply coal to the fleet. Li Hung Chang first became known to the Western world as the friend and ally of Gordon in the suppression of the Taiping rebellion, and is one of the most enlightened and ablest of the Chinese viceroys. In 1878 coal mining was begun at Tongsan, about 80 miles northeast of Tientsin. It was arranged to build a railroad 29 miles long from the mines to the nearest navigable water, that is, to Lutai on the Peh Tang Ho. It was then, in 1878, that Mr. Kinder went out as Resident Engineer. Before the railroad work could be begun the authorities had decided to operate a canal 21 miles long, to a point within seven miles of the colliery, and to connect the canal and colliery by a tramway, to be worked by mules; this was done.

Fortunately the gauge of 4 ft. 8½ in. was, after much difficulty, sanctioned, but it was stipulated that no locomotives should be used; but before the track was completed this had virtually become a dead letter. The country was easy, but several sharp curves were introduced to avoid graves. Subsequently the owners of these graves, objecting to the noise so near the bones of their ancestors, allowed the remains to be removed and the line was rectified. This track was laid with 30-lb. steel rails, flange section, and ballasted with broken limestone.

During the winter of 1880-'81 Mr. Kinder built a locomotive in the shops of the company. This was described in the *Railroad Gazette* of Aug. 19, 1887. It was built entirely of odds and ends which could be procured without attracting attention. The boiler belonged to a portable winding machine. The wheels were 30 in., Whitney chilled wheels, which had been bought as scrap castings, and the frames were made of channel iron. Before this was finished its preparation became known and orders were issued that it should be stopped. Eventually, however, through the offices of Li Hung Chang, Mr. Kinder was allowed to finish the locomotive, which was christened the "Rocket of China," just 100 years after the birth of George Stephenson. On the 8th of November, 1881, this engine took a party of officials over the line at a speed of 20 miles an hour, and after that the objections to locomotives were virtually abandoned. Mr. Kinder says that there is little doubt that if this engine had not been built as it was, in China, and by native workmen, it would never have been allowed to run, and the use of locomotives would have been postponed for many years. The present locomotive equipment of the whole system is as follows:

- 2 ballast engines, 8-in. × 16-in. cylinders.
- 2 6-wheel tank, 10½ in. × 18 in. Stephenson.
- 6 10-wheel tank, 15-in. × 18-in. Dübs and Sharp, Stewart & Co.
- 1 10-wheel tank, 15 in. × 20 in. Grant, United States.
- 4 "American" type, with tenders, 17 in. × 24 in. Dübs.
- 2 Mogul, with tenders, 17 in. × 24 in. Now building.

The water is very bad, but so far steel has given results quite equal to copper for fireboxes. The American engines were built to the same order as the 6, 10-wheel tank engines, but cost more. The boiler steams better than any other on the line. It is Belpaire type, and burns more coal than any other engine doing the same work, but it is a favorite with the drivers. The driving wheels are 48 in., those on the others 42 in. Hereafter no drivers will be less than 48. The engines weigh from 38 to 42 tons in working order. Mr. Kinder says that the passenger engines have a bogie in front, with four-coupled, 70-in. drivers. These, we suppose, are the 17 × 24 American engines, but there is no definite statement to that effect in the paper. All engines have outside cylinders. The average consumption of coal is 40.18 lbs. per mile, which is not considered excessive, as the quality of fuel is 10 per cent. inferior to that of Newcastle coal, and the bad water supply is very unfavorable to economy. The trains commonly consist of from 30 to 40 vehicles, carrying some 200 passengers and 200 to 400 tons of freight.

We return now to the story of the construction. After the tramway was built, for some years, no more railroad work was undertaken. The Franco-Chinese wars stirred up the government, and finally the mining company was authorized to push its line to Lutai, in order to carry coal more rapidly to the shipping. The mining company had no funds to do this work, and the Kaiping Railway Company was organized, composed of Chinese capitalists. The money was hard to raise, and it was decided to use a 45-lb. flange rail, Sandberg section. The canal bank was made use of for the roadbed most of the way. The rails were procured of Krupp. The first spike of this extension was driven Nov. 22, 1886, and the line was completed in May, 1887. The total cost of the new line, including one American locomotive and 40 10-ton coal cars, was something under £34,000.

This work being successfully finished, the Viceroy began urging an extension to Peh tang and Taku, with an extension from Taku to Tientsin. Mr. Kinder was called upon to make an examination and report upon the routes. The extension to Tongku was permitted, and the company was renamed the China Railway Company, the administration remaining, however, in the same hands. The work had hardly begun before orders were received to extend the line to Tientsin, the whole 50 miles to be finished in four months. The rails

adopted for the Lutai-Tongku line were 60 lbs. per yd., Sandberg section, and for the Tientsin line 70 lbs. per yd.

The sleepers are largely of chestnut from Japan. The ballast is refuse from stone quarries. The foundations for bridges and openings are generally on piles, capped with cement concrete. The piling is Japanese fir and Oregon timber. The bridge abutments and culverts were built of limestone, the cost of the completed masonry averaging about 22 cents per cubic foot.

A large number of bridges and openings were required. On the total line of about 100 miles from Linsu to Tientsin there are 65 structures of 146 spans, from 12 ft. up to 120 ft. in the clear, giving 7,716 ft. of opening. There are also 102 drains, with a total area of 1,110 ft. The most important bridge is at the crossing of the Pehtang River at Hanku. This consists of 10 deck spans of 50 ft., eight of 30 ft. and a swing span of 60 ft. The abutments are of masonry, but owing to the want of funds and of time the piers were built of timber. The cost of the bridge was about £8,000. The girders are of the plate type, the track being laid on ties bolted to the top flanges, spaced 12 in. in the clear, with guard-rails notched down to preserve the spacing. The piers consist of square Oregon piles. Considerable ice runs up and down with the tide in the spring, and ice breakers are provided to protect the piers. In the spring of 1889 one pier was bent by the ice, vertically, to a serious extent, but on the turn of the tide it came back to its place. About 2,000 junk pass up the river every year, making a swing span necessary. The free end of this span is leveled by capstan-headed screws, provided with locking gear and connected with a signal, so that everything must be in place before the clear signal can be given.

While the line from Tientsin to Peking was under serious consideration the bridge across the Pei Ho at Tientsin was begun. While Mr. Kinder was away in India a clique, headed by some high officials, determined to have the bridge destroyed. They raised so great a clamor about the obstruction to navigation that the Viceroy gave the order for the nearly-completed bridge to be destroyed, although 100 of the largest junks had already safely passed through. The bridge had a central pier on four iron cylinders, 7 ft. in diameter, filled with concrete. On this was a swing span of 150 ft. over all. The approaches consisted of four spans of 25 ft. on each side. The iron work was made by the Patent Shaft & Axletree Company, of Sheffield, from designs of Mr. James Cleminson. The loss to the railroad company was about £8,000, but most of the girder work has been altered and used on the extension northeasterly to Linsu.

But little information is given as to operation. Native workmen are employed almost entirely. Several cases have occurred of trains being split and derailed by a switch being thrown under them. This has been provided against by locking the switch with a bolt in the middle of the track. The native does not care for trains, but he quickly learns that he cannot meddle with this bolt without losing his life, so this difficulty has been eliminated. Interlocking is used at the junction at Tongku, but the natives are constantly stealing parts of the apparatus. It has been found impossible to maintain distant signals unless a watchman lives near each one. Owing to accidents having occurred from the destruction of a signal arm, Mr. Kinder has adopted the idea, suggested many years ago in England, that absence of a signal arm should invariably mean danger, and that the clear signal should be given by the arm being raised to the horizontal. The stations are connected by telegraph, with Morse instruments worked by native operators, but the trains are moved by the staff system only. There are many level crossings. These are protected by gates and signals, but the gatemen are very unreliable and no dependence can be placed upon any signals after dark.

Between Taku and Tientsin the passenger traffic often exceeds 800 a day, but mixed trains only are run, and the speed is kept below 20 miles an hour. The first-class rates are about 1.4 cents per mile and the second-class about half of this. A special charge is made for coupés. The average rate for heavy goods and minerals is .9 cent per ton per mile. This varies, however, with the length of the haul.

The first train reached Tientsin in August, 1888. Not long after this the line to Peking was authorized, but through official intrigue the sanction was shortly withdrawn. Mr. Kinder is not enthusiastic as to the future of railroads in China. The difficulties in the way of their extension are great and peculiar. They arise partly from the jealousy, narrow-mindedness and selfishness of the viceroys of provinces and the aristocratic classes, and partly from the objection to any system which shall take away the means of livelihood of a great mass of the lower class of the people. Mr. Kinder's idea is that the system must be built up by small lines, built little by little, where they are most required, or will arouse the least opposition. Of course, to do this economically and effectively these lines must be so projected that they can eventually be united. This, however, is hard to accomplish in a country where each province has its own viceroy and where every viceroy has his own ideas.

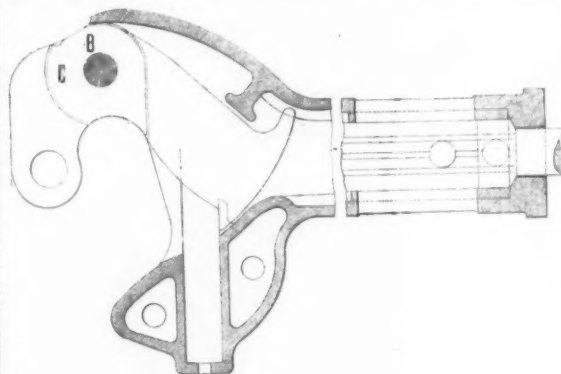
The standard gauge line of China is now a little under 100 miles, and there are about 20 miles of 3 ft. 6 in. gauge on the Island of Formosa. The capital expended on the standard gauge line amounts to

about £280,000, exclusive of wharves and real estate not used for railroad purposes, or almost exactly £2,800 per mile. This extremely low cost can only have been reached by most careful management, financial as well as physical.

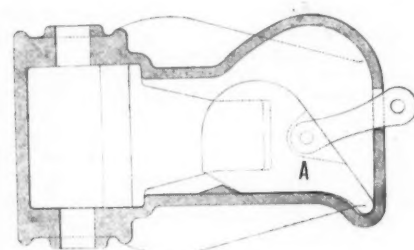
The Buckeye Vertical Plane Coupler.

Since the last illustration of this coupler, it has been changed in several important points. The cuts show the arrangement of the parts as now made. The shank is arranged for the tail bolt, strap, or continuous drawbar. The head of the coupler is made of malleable iron, the knuckle of cast steel. It has a gravity lock operated from the guard arm, as shown at A, by means of a rod connection. The lock has no fastening; it is simply dropped into a pocket at the bottom. It drops in front of the knuckle when closed and slides upon the top of it when the knuckle is open. There is a large bearing for the lock on the tongue of the knuckle and on the head of the coupler. The leverage against the lock is reduced below the average.

In the construction of the knuckle the manufacturers have taken care to secure an economical distribution of metal, and by placing the fulcrum pin of the knuckle



Horizontal Section.



Vertical Section in Front of Lock.

THE BUCKEY COUPLER.

some distance back in the head the strength of the ears of the coupler head is considerably increased. The total weight of each coupler is 219½ lbs.; the weight of the knuckles 65 lbs. each. The extra weight of knuckle arises from the increased width of wearing face. The M. C. B. lines are followed at all points.

This coupler has been in use on the Vandalia line since June of last year with satisfaction, and as stated by their Master Mechanic no breakages are reported. This coupler is also used on the B. & O. and B. & O. South-western. It is known as the Buckeye automatic car coupler, and is sold by the Capital Journal Box Company of Columbus, Ohio; Western office, Phenix Building Chicago.

The Time Convention.

The spring meeting of the General Time Convention was held at the Hotel Brunswick, New York City, on Wednesday of this week, about 30 representatives being present. The president's address is printed below.

The annual election of officers resulted as follows: President, H. S. Haines (Savannah, Florida & Western); First Vice-President, H. F. Royce (Chicago, Rock Island & Pacific); Second Vice-President, Lucius Tuttle (New York, New Haven & Hartford); Secretary, W. F. Allen; Executive Committee, G. W. Stevens (Chesapeake & Ohio), C. W. Bradley (West Shore); Train Rule Committee, Pennsylvania Railroad (present member Robert Pitcairn); Central of Georgia (present member, Cecil Gabbett); Lake Shore & Michigan Southern (present member, W. H. Canniff).

The time agreed upon for the spring change of timetables is May 10.

The Committee on Car Service made a report dealing chiefly with demurrage, and giving the facts about the demurrage associations of the country as heretofore fully reported in the *Railroad Gazette*. The committee deplores the extensive practice of making exceptions to the rules both in free time allowance and in rates per day, and presents a communication on the subject received from the National Association of Car Service managers, which was agreed upon at the convention of that body in Richmond, Va., March 25. The managers point out the fact that 95 per cent. of all the cars they handle are released within 48 hours, and urge that the time convention try to make the 48-hour free limit and the dollar-a-day rate universal. Many roads are members of several different associations and are liable to become involved in complications which will develop charges of discrimination. It often happens that a single firm ships a commodity over one road to a variety of places, charging a variety of rates for demurrage. It is urged that all exceptions, no matter how numerous, ought to be treated as in the nature of a claim for refunding of car service. If rules are not tightened, the demand for exceptions will constantly increase. Different rates for different kinds of cars will also make trouble, and are to be deprecated.

The Time Convention Committee indorses these views

and suggests that demurrage rules ought to be applied to cars standing with company material. The committee reiterates the statement that demurrage has been "most satisfactory to the public," but no increase in the average handling of cars can be discovered. A reform in car service (interchange) rates is the only remedy. The committee deplores the present waste involved in running private cars, which is increasing, and it is suggested that the mileage rate on all cars should, perhaps, be reduced, without regard to whether a per diem charge is adopted.

The Committee on Train Rules made a report, in which was considered a number of questions asked by members concerning ambiguous or insufficient rules. Rules 30 and 37 are recommended to be amended so as to read "two green flags by day and night, and in addition two green lights by night, etc." The increasing use of bright electric lights at stations is one of the reasons given for making this change. The diagrams illustrating the manner of using signals should be altered accordingly. Rule 108 is made to read:

"The disabled train will assume the rights of the last train passing it, with which it exchanged rights or orders, till the next telegraph office which is open is reached."

Answers are given to several other questions, but in

most of the cases the questions are either of doubtful pertinency or the answers are obvious.

A form of record and operators' transfer of orders has been considered and is regarded favorably, but the committee declines to recommend anything of the kind as standard. A recommendation concerning the shape of semaphores is asked for, but the committee declines to take action. It recommends, however, that distant signals at facing point switches, which are intended to stop the train [at the signal], be red. The committee reprints Col. Haines' recommendation, made last fall, that fuses be more fully recognized in the standard code, and proposes to issue a circular for information on the subject. The Savannah, Florida & Western circular, explanatory of Rules 90 to 99, which was printed in the *Railroad Gazette* of Nov. 28, is reprinted. This report of the Train Rule Committee was, after discussion, adopted.

The Committee on Safety Appliances makes a report of 24 large pages, giving answers to a circular asking information about continuous steam heating for passenger trains. The circulars were sent out December 1 last, but only half the members have replied. Roads controlling 45,000 miles, or 29 per cent. of the mileage of the country, are testing continuous heating, and have made substantial progress, so that "on the whole, the committee believes that at no remote period a solution of the problem will be had." The committee cannot make any final recommendation, "nor would an elaborate analysis be of any value at present." It reports progress, and will be persistent in its efforts to get information from members and put it in available form.

The new rules of order for the conduct of the meetings, provided for at the last session, were presented and adopted, and the name of the organization was changed to the American Railway Association. The next meeting will be held October 14.

ADDRESS OF PRESIDENT HAINES.

In the address which I made in this room just a year ago I called your attention to a matter about which I propose to speak to-day at greater length, and I will preface my remarks by a quotation from that address: "A railroad system properly organized, has its staff, field and line officers, its supply departments, its inspectors, its divisions and districts of operation; in a word, it is an army, whose office is not to slay, not to devastate, but to transport the people and products of a country. This is its function, and to this end all of its efforts are directed; and to accomplish this end successfully, discipline is as essential as in a militant organization."

This, then, is my theme to-day, the subject of discipline, which I shall endeavor to place before you as it appears to me; to impress you with the importance of viewing it in a broad light as affecting the interests of the public and of the railroad employé as well as of the stockholder. I am the more impelled to do this for the reason that the purposes for which it is sought to maintain efficient discipline upon a railroad are not clearly understood by those who are subjected to it, nor are they always kept in view by those whose duty it is to enforce it. To arrive at such an understanding it may be well to recognize what is meant by discipline in its broad sense.

Discipline really means teaching or training, and those who are the subjects of discipline, those who are being trained or taught, are known as disciples pupils. The object then which is to be attained by discipline is the

teaching or training of certain persons that they may be better fitted for the work which they are to undertake. This is the starting point from which I propose to discuss this question of discipline on a railroad; that is, look upon it as the training of certain persons for a special purpose, the safe and speedy transportation by rail of passengers and freight; and the persons whom we have in view, the railroad employes, we are to consider as pupils who are to be instructed and trained in the efficient performance of this very important work.

These employes come from the ordinary walks of life, generally before they have attained their majority, not only ignorant of railroad rules and regulations, but with minds uninformed and possibly with habits already acquired of which they must divest themselves to acceptably discharge the duties required of them. They make their appearance in the railroad ranks as track hands, as brakemen or switchmen, as engine wipers, or as messenger boys, and are the raw materials out of which are to be made section foremen and road masters, conductors, dispatchers and masters of transportation, locomotive engineers and master mechanics; and I have only to look around me to see that from this number, by a process of natural selection, are obtained many of those who have risen to the highest offices in the railroad service.

Beginning with the raw material which is to be molded into serviceable shape, we have first to ask whether this material should not be picked over, that selected which seems best adapted for our service, and that rejected which is evidently unfitted for it; whether that selection or weeding out, which is inevitable at some stage in the discipline or training of railroad employes, will not be facilitated and the operation made easier both to those who are to teach and to those who are to be taught, if a preliminary examination be made essential to the employment of all novices in the transportation service. Such an examination, to be of value, should take the form of an inquiry into the physical, mental and moral characteristics of the applicant in a general way, and embrace some further tests of his suitability for the particular branch of the service in which he seeks employment. Looking at the physical examination, it is plain that a man who is deaf or blind is out of place here, and that defective sight and hearing should be detected before they cause the loss of life or property. The examination might also include a search for serious defects in other organs than those of sound and vision. The mental examination ought to cover certain educational requirements, at least enough to show that the applicant can read and write the English language, and has a sufficient knowledge of the general rules of arithmetic. The moral examination should provide for some satisfactory evidence as to the reputation of the applicant for honesty and sobriety. Such a preliminary examination could fairly be required of one who sought a position in which, at an early stage in his career, he would be called on for some exercise of the qualities I have mentioned. The flagman, the fireman, the telegraph operator should be able to see and to hear, to read and to write, to keep sober and to tell the truth, and it is due to the public that they serve and to the employes with whom they serve that their ability to do these things should be tested before they are tried and found wanting in actual service. The establishment of preliminary examinations should assure to those who have passed them a prescriptive right to employment as opportunity offered; and after it had become well known that the holder of a certificate would have precedence for employment over those who were not so equipped there would be no difficulty in obtaining material so selected for training in railroad service.

With the admission of a raw recruit into the railroad ranks should begin his special training for the particular branch in which he is to serve; the acquisition of manual dexterity in his calling, of aptness in observing and imitating the operations in which he is to take a part and especially of a knowledge of the rules and regulations which are to guide his conduct. Our experience in railroad management is leading us to recognize more and more the importance of a thorough knowledge of rules by those who are to obey them. Indeed what kind of obedience can be expected where ignorance prevails? Take for instance the standard train rules. Recall the labor expended upon them that they might fulfill their purpose and be clearly understood. They are to guide the train dispatcher, the operator, the engineer, the conductor and the flagman; and in the performance of their duties those rules are to be strictly observed. How can you demand this of men who do not know what is expected of them? I, therefore, insist that the regulations of the company, and especially the train rules, should be taught to the beginner, and that his proficiency in them should be essential not only to his advancement but to his continuance in the service. This will call for examination on this particular subject when time enough has elapsed after his entry into the service for any man to have acquired a knowledge of them who had been able to pass the preliminary examination. If these rules are of such importance as to have occupied for months the minds of some of our ablest railroad managers in order to make them a safeguard against accidents, then it is not asking too much of the employes to show that he knows how to conform to them before placing him where a failure to do so invites disaster.

But knowing is one thing and doing another. Many men are able to do things which, through indifference or neglect or recklessness, they fail to do, and it is not enough that we assure ourselves that our men know what to do to avoid accidents; we must endeavor to be equally sure that they will apply that knowledge at the proper time. This we must make their interest to do by the time-honored inducements of reward and punishment. From the highest heavens to the lowest depths, this has been the mainstay of lawgivers both human and divine, and it must also be ours; that is, we should have a penal code to ensure the observance of these rules by those who, in the absence of such a code, would not respect them. We have something of this sort at present. We offer promotions and a choice of positions to those who do well, and we resort to fines, suspensions or dismissal of those who do badly. But for a system of rewards and punishments to be effective it must be a system indeed. It must, as far as possible, protect the employe against the results of malice, bad temper or hasty decisions on the part of his immediate superior. A man should lose neither his job nor his pay, except for a clearly established violation of a rule with which he is familiar; his side of the case should be heard before judgment is pronounced, and the penalty should be graded to suit the extent of his offense. All this requires patience and self-restraint on the part of his judges, and if they are lacking in these qualities, not justice, but injustice, will often be done. It is not sufficient then to publish a well-devised set of train

rules and feel that your duty as to enforcing them has been done if you suspend or dismiss some one whenever there is an accident. Your duty requires you first to see to it that every man put under those rules shall know what is expected of him, next that there shall be such an inspection and supervision of their work that violations of rules are detected before a bridge falls down a derailment takes place or a collision occurs; and further that punishment shall follow swiftly upon the heels of the offense—not capriciously, nor hastily, nor abusively, but the violation must be brought home so clearly to the offender that he has to acknowledge his shortcoming and in some way to suffer for it. It is not so necessary that the penalty be severe as that it shall be certain and justly inflicted. As I have already said, this calls for patience and self-restraint on the part of his judges; but surely the purpose in view is worth all that it will cost, and it is part of the value of true discipline that it acts beneficially upon the superior as well as upon those placed under him. A proper sense of discipline will prevent abusive language or tyrannical conduct as well as disrespect or disobedience. Repeating the language of my previous address, "For this work to be successful we must arouse among our men a feeling of pride in the organization to which they belong, of respect for their officers, and of interest in the work which they have in hand, which is known as *esprit de corps*, a spirit which has carried armies through privation, suffering and defeat to victory, and without which no body of men can be controlled under adverse circumstances." This is the spirit which impels the flagman to go back in snow or rain to flag an approaching train instead of skulking in the caboose; which nerves the engineer to stand at his throttle lever when danger is impending rather than leap for his life and leave his passengers to their fate. This is the spirit which results from the training of mind and body to do the right thing at the right time, that true discipline which is the foundation of efficient service.

I have not attempted to enter into details as to methods. The time is not sufficient for me to do so, particularly as there is yet another aspect of the subject on which I wish to say something before I close.

For some reasons, there is in some quarters a disposition to resent the attempt to enforce discipline and obedience to rules by any penalties; and yet, as I have said, no code of laws has ever been satisfactorily administered except through the medium of rewards and punishments. The object to be attained is one in which the welfare of the employe is at stake as well as the lives of passengers and the property of the company. It is this view which should be impressed upon the minds of the men as the aim and end of rules, that, so far from discipline being a degradation to a right-thinking man, to one who means to do his duty it is intended to lift him to a higher grade of usefulness, by such training as will better fit him for it. If with this idea is also conveyed a sense of just treatment we may hope that these erroneous impressions will be removed, and that the employes will sustain their officers in their efforts to secure a prompt compliance with rules and an impartial and conscientious enforcement of discipline.

The traveling public has also an interest in the enforcement of discipline, which is brought home to every passenger who has been an eye-witness to a train wreck. It is safe to say that in a majority of cases the immediate cause has been the neglect of duty by an employe. The railroad company may invest millions in bridges, rails, signals and equipment, all of the most approved design and construction; the management may keep up with the times in the adoption of devices and rules for the protection of trains, and yet all this expenditure, all this care and forethought be neutralized by the laziness or recklessness of an employe, and a fearful accident ensue. Here it is that we should call public opinion to our support. Let its powerful exponent, the newspaper, blame the president and board of directors if they have been niggardly in expenditure or have retained incompetent officials; let it inveigh against the manager or superintendent if they have personally failed in their duty, but let it also include in its invective the employe, who, knowing his duty, has failed to perform it. The courts of the land should aid in this work. The violation of a train rule should be considered as an infraction of the law, and the guilty one should have to face a jury of his countrymen as well as a railroad court martial, when death and disaster can be traced to his neglect or misconduct. In no way can the newspapers of this country do more to increase the safety of railroad travel than by insisting that a violation of train rules shall be punished by law.

There is another and a higher view that we should all take of this question of railroad discipline, that which is based upon a sense of duty—of the faithful discharge of the obligations which we have voluntarily assumed—the view that what we have undertaken to do, what we are paid to do, we must do honestly, conscientiously, fearlessly; that view of duty which has been expressed by one of our great thinkers in four lines, with which I will conclude my address:

So high to glory is our dust,
So high is God to man,
When duty whispers low "thou must!"
The soul replies "I can!"

Shop Notes—Kings County Elevated.

The shops of the Kings County Elevated Railroad, of Brooklyn, are at the end of the line, and are built on a level with the structure of the road. The buildings are carried on wooden trestles. The machine shop contains a few tools of the best class, which are well arranged for the work to be done. The light is excellent, and every convenience is given to the workman. In the shops there are a number of engines being repaired. Frames, driving wheels and crossheads give the most trouble, and future engines will differ materially from those now used.

The paint and car shops are convenient, and are well heated, as are all of the other shops, by the overhead system, using the exhaust steam from the engine. All drip returns to the feed-water heater, from which the water is pumped to the boilers. The blacksmith shop is on the ground floor below the level of the railroad structure. It is well ventilated by large hoods and pipes leading to the chimneys. The engine which drives the shop is a "Porter" with a riding valve. It, with its two attendant boilers, is placed on the ground floor, next to the blacksmith shop. The water for the shops and the

locomotives is taken from an artesian well. It contains a considerable percentage of scale-producing compounds, but, owing to their solubility, they are not particularly troublesome in the boilers.

The coaling station is excellently arranged after plans made by Mr. William T. Goundie, the General Manager of the road. The coal is not handled until it is shoveled into the buckets, which are run out on a double crane to be emptied into the engine tank. The double crane is so arranged that two buckets may be run out at the same time, and as the crane tracks are converging they may both be emptied into the engine tank, one after the other, without moving the engine.

This line is difficult to care for, because of the grades, and service required. Five-car trains, on a line of very irregular grades, at two minute intervals, do not make an easy problem. The sharpest curves are 97 ft. radius, and there is hardly a half mile of level road. The entire seven miles is one succession of hills and hollows. During the morning and evening hours heavily loaded four-car trains are hauled from the level of the Fulton Ferry to the level of the structure on an incline of 2½ degrees. This requires a pusher in addition to the regular engine. After pushing up a train the pusher backs down and becomes the head engine for the following train.

Lake Erie & Ohio River Ship Canal.

The Lake Erie & Ohio River Ship Canal Commission has issued a pamphlet of memoranda compiled by Mr. J. M. Goodwin, of the Commission. These memoranda embrace many valuable facts and statistics, as well as much interesting detail of the estimates of cost given in the recent report of the Commission.

Reference is made to the French experiments with the steamer "Etoile" for speed in channels of various sectional areas. This steamer showed a speed of 7.8 miles per hour in open water; in a canal 8.3 times the sectional area of the steamer six miles; in a canal 3½ to 4 times sectional area of steamer 3.6 miles; in a canal 2.6 times sectional area of steamer 0.75 miles. It is computed that a steamer of 34 ft. beam, drawing 13 ft., and having in open water a speed of 10 miles per hour, may make something near five miles per hour in the Lake Erie & Ohio River Ship Canal. A steamer of 40 ft. beam and 14 ft. draft would reach about 3½ miles per hour. In the Welland Canal steamers are limited to 5 miles per hour, and those of 14 ft. draft make about 3 miles per hour in the "reaches," making their progress about 1.3 miles per hour for the 25 miles with 25 locks.

Mr. Goodwin gives detailed statements of the cost of dredging on several important works in different parts of the world; and estimates the cost of doing similar work under the conditions prevailing in this country. Where material is deposited alongside the cutting the cost is put at about 3.5 cents a yard. Where material is floated to a dumping ground, say two miles distant, the cost would be something less than 6 cents.

Passing to the consideration of the proposed canal work, it is shown that for "ordinary section" the excavation would be about 40 cu. yds. per lineal foot, and estimating the work of a dredger at 2,000 cu. yds. per "turn," would give an advance of 50 ft., or, say, 84 ft., in 24 hours by working "double turns." This would give an advance of one mile in 63 days or 5 miles per year for one dredger. If each machine were to average 1,500 yards per "turn" (3,000 yds. in 24 hours), then 23 machines could do all the excavating on the 51.9 miles of canal between Lake Erie and the Shenango River (estimated at 21,212,101 cu. yds.) in 307 days or something less than a year.

The estimate for contractor's plant would be somewhat as follows:

23 dredging machines, etc.	\$1,000,000
5 river dredgers	150,000
1 lake dredger	50,000
100 derricks, shops, etc.	135,000
99 miles railroad and switches	365,000
18 locomotives	108,000
1,000 dump-cars	250,000
Engine-houses, shanties, stables, etc.	13,000
100 horses, 50 wagons, with harness, etc.	20,500
	\$2,091,500

The aggregate cost (per estimate) of work to be done by contractor is \$23,706,831, and it is believed that it can be accomplished in three years if funds can be provided so that the contractor can push right along.

Attention is drawn to the abundance of sandstone, suitable for the construction of locks, along the Beaver River section of the canal. The quarries are numerous, and have excellent facilities for the shipment of stone, which, after the construction of the contractor's railroad, can be delivered at all points along the route by rail, with an average haul of 50 miles. The cost of masonry is estimated at \$7.55 per yard, the details being as follows:

Stone, f. o. b. at quarry	Per yd. \$2.00
Cutters and helpers	2.25
Templates, etc.	.02
Repairs of tools, etc.	.08
Miscellaneous	.02
Freight, average 50 miles, at 1c. per ton per mile	.05
Laying	1.68
Pointing	.05
"Wampus" cement and sand	.50
	\$7.55

The price upon which the ship canal estimate is based is \$10 per cubic yard for "lock" and "first-class" masonry.



Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The superintendents of motive power of the Vanderbilt lines met last week in New York to consider the question of the best action of those lines in the matter of car couplers. The results of the meeting have not been given out, but so far as we can learn they are essentially as follows: The lines represented were the Boston & Albany, New York Central, Lake Shore, Michigan Central, "Big Four" and Chesapeake & Ohio. It was decided to equip the freight cars of these lines as rapidly as possible with vertical plane couplers, and to restrict orders to the three with which these lines have had most experience, viz., the Janney, the Gould, and the Standard or improved Dowling. We have been told that the discussion developed the fact that it had been found that the maintenance of the vertical plane coupler costs less than the link-and-pin. It would not surprise us to know that this was the fact, although we have no official assurance that this was the definite conclusion of all, or a majority, of the officers present. If we are not mistaken this action will have a very important effect in hastening the action of other roads. It indicates that there is no danger of a retreat from the position taken by the presidents of the Vanderbilt lines last fall, and it attacks the opposition to the vertical plane coupler in its citadel.

The Time Convention, which we must now call by the less distinctive name "American Railway Association," has met as usual, but it did not do anything startling in the way of thawing out its untalkative members. It has, however, through its ordinary committee channels, brought out some contributions to general railroad knowledge and discussion which are not unworthy of notice. President Haines delivered another good address, which will be found in our report. Readers who always skip every article that fills more than a column will do well to make an exception in this case, as Col. Haines' preaching is interesting and valuable. Its worth, like that of much other forcible preaching, is not to be judged by the fact that the hearers virtually held their peace. The Train Rule Committee has done well to discuss questions about rules more fully than formerly, but it has not yet got hold of the questions which are most in need of discussion. The Car Service Committee's recommendations are, perhaps, the most valuable that were made to the convention, but they are, unfortunately, the least likely to be carried out. The Safety Appliances Committee has done a lot of work in gathering information about continuous heating, but it cannot summarize the facts obtained because important roads failed to answer the circulars promptly.

Suggestions for the Committee on Safety Appliances.

The Time Convention's Committee on Safety Appliances this year confines its labors to car heating; but it has made no final or conclusive report on the subject. We should expect no such report in the present state of the art. That is, we should not expect a committee to be able to decide definitively between the "return" system and the

"direct" system, or between "straight steam" and water circulation heated by steam. We should not expect a committee to be able to say finally that a continuous system is cheaper than the best independent system, or that independent heaters, as now made are so unsafe they should not be considered at all. In fact, we do not see why a committee should be in a hurry to make a final report on this subject. There are reasons why the method of heating trains should have a good deal of attention, and prompt attention; but as a means of saving life and money it is of far less importance than other matters about which the public hears little. The public agitation of this matter has had good results, and perhaps a few bad ones. It has caused a rapid development of systems of continuous heating by steam from the locomotive (or from a tender car), and, what is probably of quite as much immediate importance, it has forced on the improvement of individual heaters. There can be no doubt that in both these ways the safety of passengers has been increased and ultimate economy of operation advanced.

But the loss of life and property from wreck fires is trifling compared with that from other causes and much more can be done by preventing wrecks than by attacking the indirect cause of a small percentage of the losses in wrecks. We think, for instance, that a very effective piece of work could be done by a careful investigation of the cash value of signals. Every one admits that block signals, interlocking at yards, junctions, crossings and turnouts, and distant signals for switches on high speed tracks add to safety in operation; but every one does not admit that it would pay him to invest heavily in these kinds of insurance. Probably a good many managers would be surprised to know how much money they could save by judicious signaling. A few months ago we published some statistics of accidents for one year on one road. They cost 1.69 cents per freight train mile. From this we estimated the cost for the railroads of the United States at \$7,279,163. But this was for the company's property and for merchandise alone. The loss from deaths and injuries we supposed might have brought the total up to \$10,000,000. But the road in question is one of the safest in the country; therefore this estimate is doubtless far within the mark. These figures suggest a fruitful field for research for a committee that could command the confidence of the railroads and could get at their statistics of accidents, when such are kept, and could impress upon the roads the value of such statistics.

One significant fact that appeared in the statistics which we published was this: The collisions on that road were 17 per cent. of all the train accidents. But on all the railroads of the United States the collisions in 1890 were about 48 per cent. of all accidents. The latter include all sorts of collisions: the 17 per cent. were collisions on open road only. But on the same road 22 per cent. of all accidents were from careless switching. If we assume that half of these were collisions we may say that on that road 29 per cent. of all accidents were collisions, against 48 per cent. on all the railroads of the United States. But that road is one of the most completely signaled in the land. The natural inference is that, were all roads as well signaled, a very important percentage of their accidents could be saved. In fact it is likely that a thorough comparative study of the cost of accidents on a few roads would show a strong probability that every dollar invested in signals earns a very large interest, and is one of the most profitable investments that a railroad company can make.

Of course there must be some relation between the density of traffic and the economy of block signaling and of interlocking; but there are few roads that do not run some fast trains against facing point turnouts. Every few weeks we hear of an accident that happens because some road has persisted in doing this without protecting the switch by a distant signal. At least one such has happened within a week. Now, it is difficult for us to get at the cost of such accidents, but the committee of the American Railway Association could doubtless collect enough such data to convince themselves and some other managers and superintendents of the money value of distant signals for outlying switches.

Of course these are but suggestions of the direction in which work of great value could be done. A careful record of the cost of accidents that could be classified and compared would be of value in more ways than one. It would show where the greatest benefit could be got from a given expenditure for protection, and it would give managers excellent ammunition to fire at directors when they are asking for money for betterments. If a director can be shown that safety means increased net earnings and higher prices for the

stock of his road, he is not as likely to think of it as a "d—d barren idealism," as the Ohio statesman used to say.

The Railways and the Traders.

Under this title Mr. W. M. Acworth, of London, has published a thorough discussion of the problem of railroad rates, as it now presents itself in England. It is not too much to say that this is one of the most valuable contributions to railroad literature which has ever appeared. It is a great advance on the author's previous works, which were little more than collections of magazine articles. To an American reader it has a special interest, as giving an intelligent comparison of the practice in the two countries in matters of great importance both to the traffic and to the legal departments.

We have no book just like it in this country: Alexander's "Railway Practice" comes nearest to it. The chief differences are: First, that Mr. Acworth writes for Englishmen instead of Americans, and, second, that his book is five or six times as large as General Alexander's, so that he can deal with the subject in a systematic instead of a fragmentary manner. The books are alike in clearness of thought and in practical readiness of application of principles. They are still more noticeably alike in the mental attitude of their authors. Each writes as an advocate rather than a judge, but each is so confident in the general fairness of the position which he takes that he is glad to push the analysis of his principles as far back as possible, and to deal with matters more candidly than the average advocate is ready to do. In one sense Mr. Acworth is more clearly an advocate than General Alexander. His book was written at the suggestion of the Railway Companies' Association as a presentation of their side of the case. This gives it a certain quasi-official character that distinctly adds to its inherent interest and value; although many of Mr. Acworth's admissions are not such as all English railroad men, or a majority of English railroad men might be willing to make.

Not the least significant thing about this book is the fact that it exists at all. A few years ago it would have been the last thing that the Railway Companies' Association would have desired. English railroad managers have been slower in allowing publicity in their affairs than has been the case on this side of the water. England in 1880 had advanced no farther in this respect than America in 1870. The English railroad men regarded themselves as dealing with an essentially private business; public no doubt in its widespread importance, but private in the character of its ownership and control. For the sake of the stockholders themselves, the managers might be ready to deal with the public equitably, but this was a matter in which, to their mind, the stockholders were concerned rather than the public at large. Today this has changed, and for somewhat the same reasons which caused the change in the United States. The people in England have begun to take up the regulation of railroad rates in serious earnest, and the English railroad companies now see, as the better American companies began to see ten or fifteen years ago, that the safeguard against reckless legislation lies in a reasonable degree of publicity. They can no longer keep the public out altogether. They therefore begin to wish that the public should see things as they really are.

A significant instance of this change of attitude is seen in Mr. Acworth's comment on English railroad returns. He criticizes them severely for their refusal to publish statistics of ton-miles and passenger-miles. Without shutting his eyes to the reasons which have led to this course, he clearly sees that those reasons will no longer hold good; that it is under present circumstances information which the public demands and may legitimately demand, and that the effort to withhold it is short-sighted, if not suicidal. Not that Mr. Acworth would be ready to make shallow or superficial comparisons on the basis of such figures. On the contrary, he brings out more clearly than almost any other observer the essential unfairness of direct comparisons of ton-mile rates due to the differences in the character of the service rendered. Nowhere have we seen a clearer presentation of the fact that differences in railroad rates between different countries are so largely due to differences in the character of the public demand. The railroad men may have had some slight influence in shaping the growth of that demand, accelerating its development where they provided facilities for a certain class of service, or retarding it by the refusal to provide such facilities. But the ultimate cause must be sought farther back, in the character and habits of the people. We have recently pointed out instances of this difference in regard to passenger

business. Mr. Acworth does the same thing with regard to freight. He shows that many of the high rates charged on shipments of produce are due to unreasonable demands with regard to the methods of transportation. The English farmer claims the right to ship his cheese unboxed. For such a right he must naturally pay. The American railroads meet the difficulty where it becomes serious by a refusal to carry cheese in that fashion. We cannot better illustrate the style of the book than by a quotation bearing on this subject.

Most people know the American hotel system, if not by personal experience, at least by description. For a sum of 18s. or £1 a day, a visitor to Washington or Chicago is made free of the house. Within wide limits, he has his meals when he pleases, and takes his choice of any or all dishes on the menu, which comprises all the delicacies of the season. From the oysters at the beginning of his dinner, to the grapes and peaches at the end, everything is served absolutely without stint. Extra charges for baths or lights, for coffee after lunch or after dinner, are practically unknown. In fact, in a country where wages and rents are very much higher than is the case in England, life at an hotel is a great deal cheaper. On the other hand if one goes to an hotel organized on the European principle, one pays for one's room much the same as in the other case one pays for everything, while the prices for each individual article of food are such as would make the experienced boulevardier, accustomed to the charges of Bignon or the Café Riche, stare and gasp.

The truth is that the plastic American intellect has introduced the wholesale principle into regions where the slower-witted nations of Europe have never thought of applying it. The factory life of England is new; and our manufacturers fully appreciate the economies to be effected by turning out pins by the million gross, cotton yarn by the million pounds, and steel rails by the tens of thousands of tons. But the Americans have applied the principle to businesses which have existed since the dawn of civilization. Their hotel keeping is wholesale, their farming is wholesale and most of all their transportation system is wholesale. The English farmer still looks upon the railway train as only a slightly magnified carrier's cart, and persists in sending his basket of eggs or his hamper of vegetables to market, as his grandfather did when George III. was king. The American farmer does his business in car loads.

How far the new departure is due to the voluntary action of freights themselves, how much to pressure put upon them by the railroads, no one can tell. But the result is to-day that the Pennsylvania Railroad, a company with probably a larger local and short-distance traffic than any other railroad in the States, reports that 80 per cent. of its business is done in car loads, that is, in minimum quantities of ten tons.

This seems simple enough when put down in black and white, but it is a point which nine-tenths of the writers on comparative railroad economy have wholly failed to apprehend. Its very simplicity, as here presented, increases the credit which is due to the author for bringing it out.

No small part of the book is occupied with accounts of American railroad practice, and of principles which have been developed and accepted on this side of the water. Unlike most foreign writers, the author has carefully gathered his information at first hand, and it is in the majority of instances astonishingly correct. He avoids the mistake of being misled by the advocates of a particular system of car construction or a particular device in engineering practice, who try to make the case seem much simpler than it really is. He sees that American rate-making is the result of a long series of experiments—some good, some bad; that America and England, with their comparative freedom of railroad management, have dealt with substantially the same problem, while continental Europe, with state management or state initiative, has had an essentially different one. We were less hampered by traditions than England and able to make experiments, both good and bad, more freely. The consequence is that both in traffic, policy and in legal discussion we are further advanced than England, though all advances are not necessarily in the right direction.

There are times when it does not seem to us that the author distinguishes as well as he ought between past and present facts of American railroad practice. It is clear enough that he knows the difference in his own mind, but it is not equally clear that his readers will know the difference. He cites cases which were brought out in the Hepburn Committee investigation twelve years ago as though they were typical of what still exists. His quotations of rates from Chicago to New York and to intermediate points would give a totally wrong impression of the manner in which rate sheets are at present arranged. Still more open to exception are his appendixes giving comparative rates on produce of various kinds in England and in America. The figures themselves are correct enough, but it is not made sufficiently clear that the American figures thus chosen are exceptionally high and the English rates more or less typical. The comparison thus appears too favorable to the English railroads. If Mr. Acworth should reply that similar comparisons which had been made by Sir Bernhard Samuelson and others had been even more unfair on the other side, we should reply that Mr. Acworth was writing a better book than Sir Bernhard Samuelson ever thought of trying to write, and that any explanation like this involved a temporary lowering of himself

to his opponent's level. If he should say, as he might more fairly, that he had simply chosen rates where American traders in exceptional instances demanded the kind of service habitually given in England, we should reply that the very fact that these rates are exceptional in this country makes it unfair to take them for comparison without special and explicit recognition of this fact. Any temporary advantage which the Railway Companies' Association might lose by such candor would be more than gained in the permanent influence of the book, which cannot fail to suffer a little if any part is not kept up to the high level of the whole.

The Board of Rulings of the Trunk Lines and Central Traffic Association roads have notified the Chicago & Alton that the roads represented by the Board will refuse to ticket passengers to or from the Alton after April 15, this action being in pursuance of the threat made three months ago in connection with the request not to pay ticket commissions to the Eastern roads' agents. General Manager Chappell, of the Alton, says that his road ceased paying commissions to Eastern agents at the time the original order of the Board of Rulings went into effect, and did not resume until April 1. "The only reason we did so then was because we learned, beyond question, that, notwithstanding their denials, the majority of the Western roads were still paying commissions, in the forbidden territory. Because our general passenger agent issued a circular refuting a statement that we were opposed to the payment of commissions the Eastern lines propose to divert business from our road. In other words, we are to be boycotted for a mere declaration of principle, which is in perfect accord with the agreement of the Western Passenger Association, of which we are a member.

"If the trunk lines are sincere in wishing to abolish the system why don't they discipline their own agents, who accept commissions, instead of jumping on the Western roads, which have an agreement allowing the payment of commissions?" It appears that the Burlington is about as firm in its attitude toward the Eastern roads as the Alton, and may be similarly boycotted, but the other roads are quiet.

The passenger trainmen of the New York Division of the Pennsylvania Railroad have got up a petition for an increase of wages, and they give the reporters a statement showing that the rates paid now for the round trip of 182 miles are, for conductors \$3.25, and for brakemen \$1.65. This is one of the best managed roads in the country, and the case will afford a good illustration of the questions that arise when a demand of this kind is made. In most demands for better pay there are so many uncertainties that the public, who are really depended upon for support and sympathy, cannot form a just opinion, but here the conditions are very simple. There are a large number of men running the same kind of a trip, and there are practically only two grades of trains—express and accommodation. If they make one trip a day for six days in a week, any one can readily judge as to the adequacy of the pay. But in this, as in nearly all cases that have been appealed to the public, a part of the evidence is held back. Formerly a trip from Philadelphia to Jersey City and back was a good day's work, but now a number of the trains make the journey so quickly that it is no great hardship for a crew to double the road; probably a good many of them do this, and it will therefore be necessary for the men to tell, not only the rate of pay per trip, but the average number of trips or hours per week, before any one can judge of the reasonableness of their claims.

So conservative a state as Massachusetts indulges in more or less nonsense, though it is happily true that not all the notions presented to the legislature are crystallized into laws. Just now some one has presented a bill involving the Minnesota idea of compelling sleeping car companies to keep upper berths fastened up when not in use. Even the dignified Boston papers have editorials on the subject, and the familiar arguments are fully rehearsed. But both Massachusetts and Minnesota, as far as we have seen, overlook the one practical objection to the plan, which is, that when an upper berth is lowered for a picked-up passenger, say at 2 a. m., the operation is quite sure to disturb the sleeping occupant of the lower berth. This is a matter in which the passengers themselves are interested. Even if the man in the lower berth were ready to wholly waive his rights of privacy it is by no means certain that the other party would be pleased with the arrangement, so that a change in the custom might result merely in producing a new class of complainers to take the place of the other.

The essential point of the ticket decision recently rendered by the Supreme Court of Utah and widely published in the press dispatches, seems to be that where a ticket contains conditions, such as "not transferable," the holder is bound by those conditions even if he does not sign them. In this case the Union Pacific agent at Blue Rapids, Kan., sold two tickets to Los Angeles, and, apparently by neglect, omitted to require the purchaser's signature. The latter sold the tickets to a broker at Ogden and the second holder was ejected from the train on the Southern Pacific. The broker gave this man a letter to the conductor assuring the validity of the tickets, and the judge says that the buyer

ought to have known that this was evidence of the irregularity of the tickets, although the writer of the letter was, or pretended to be, agent of the Union Pacific. The weakness of the speculators' case was in assuming that, because there was a blank space for a signature, nothing but a signature could bind the purchaser to the printed conditions.

The first Western States Commercial Congress, which is called by resolutions of the Kansas Legislature, will convene in Kansas City April 14 and continue in session during the week. Delegates have been appointed by all of the Western States. The programme includes, among other topics, legislation as affecting commerce, transportation and finance; transportation and improvement of waterways and ports; markets, irrigation, combinations and trusts, and reciprocity. It is to be hoped that the delegates are real business men, with genuine interests, and not cranks. From an assemblage of men who are in the habit of applying their faculties to actual business problems we may expect real information concerning the needs and the temper of the West, and suggestions of value. If the congress is given over to professional reformers and agitators it might better not be held.

The Russian Government has begun work on the Pacific coast end of the Trans-Siberian Railroad and a considerable force is now engaged between Vladivostok and Grafskaja. The work is being carried on by Government officials directly, but from information received in a private letter we conclude that well informed Russians think that American contractors and dealers in supplies are not unlikely to find chances for business if they communicate with the Government officers. The line is through a wilderness, and it is suggested that the contractors of Western Europe are not so familiar with the conditions incident to work of this kind as are those of this country. California is, of course, one of the nearest bases of supplies.

The celebration of the centennial of the American patent system began at Washington on Wednesday. The morning session was opened by the President of the United States. According to the *New York Tribune* he "appeared on the stage in a suit of black diagonal, with double-breasted frock coat and gloves of a dark brown shade." We supposed that he would appear in his shirt sleeves. Beyond this we have no important details of the first day's proceedings. Addresses were made by several prominent men. There are said to have been 800 to 1,000 persons present.

The Northern Pacific announces a rate on flour in carloads from Spokane Falls, Wash., to Boston, via Chicago and the Chicago & Grand Trunk, of 82½¢. per 100 lbs. The distance, assuming that the freight goes via Montreal, is about 3,100 miles, making the rate 5½ mills per ton per mile.

NEW PUBLICATIONS.

Architectural Iron and Steel and Its Application in the Construction of Buildings; with Specifications of Iron Work, and Tables. By William H. Birkmire. New York: John Wiley & Sons. 1891. Pages 202; illustrated. Price \$3.50.

The author explains that this book is intended for the use of architects, architectural students and builders. Many "Builders' Guides" and "Architects' Pocketbooks" have been published, but they are as a rule too general in their remarks, and attempt to cover too much ground. Mr. Birkmire, however, has confined his efforts to explaining the use of iron, steel, etc., as applied to modern building, and beyond a few general tables has not attempted to write a treatise on building. This is the best point about the book. The information is well arranged and given in an intelligible manner, without much use of discouraging-looking calculations, which often alarm the architect and student. Architects as a class are not civil engineers, and few of them ever attempt to work out the intricate parts of iron construction, this work either being turned over to the engineer to work out, or, as happens sometimes, not worked out at all. Any book, therefore, which will give plain information in connection with the practical use of iron is more or less welcome to the architect.

The contents of the book in question are classified in a simple way, and the information required can be easily got at without having to read the whole book. The most important classifications are: Iron beams and their use in floors; lintels and their use; girders, trusses, stairs, columns, elevator enclosures, doors and shutters, etc., and the relation between cast and wrought iron and steel as adapted to the above generally mentioned uses. A good deal of miscellaneous information, such as can be found in Trautwine, Kidder, etc., is also given, but especially selected for the architect's convenience.

As is often the case in books of this nature, the artistic side is sacrificed to the practical. The chapter on ornamental iron work might be dispensed with without injuring the value of the work. Any architect who can design can generally have his ornamental iron work successfully carried out whether he knows anything about the way it is carried out or not. The illustrations offered as examples of ornamental work are unfortunate. Ornamental iron work has reached a perfection in this country that is familiar to most professional men connected with the art of build-

ing, and examples need not be shown to them; certainly not poor ones. The illustrations selected for this chapter have a flavor of "cast iron catalogue" about them, which is unpleasant. But this does not in any way injure the usefulness of the book. It will be a comfort to the architectural student, and useful to the architect. The average builder might also learn a good deal from its pages. Another useful point in the book is the introduction of a set of "specifications" for iron work and extracts from the New York building laws which relate more particularly to iron construction.

Engineering, April, 1891. Published by the Engineering Company, New York. Price 25 cents.

This is the first issue of a new monthly, the character of which is suggested by the title. It is an octavo in form, of 133 pages. There are 10 separate articles of a popular character and 35 pages of editorial miscellany. The editorial department embraces all recognized branches of engineering. The magazine is quite liberally illustrated with direct-process reproductions of photographs and pen and ink drawings. The effort to make the magazine popular in its appearance as well as in its contents has resulted in an abominably confused illustrated cover and in a lot of department headings which are intended to be more or less symbolical, but are, as a matter of fact, violent in drawing and very inelegant in effect. The illustrations in but few instances are worth the space they occupy. We do not understand exactly what unoccupied field this magazine is intended to fill, but doubtless that question has been carefully considered by its publishers. Certainly, we wish it long life and prosperity.

The Railways and the Traders. A Sketch of the Railway Rates Question. By W. M. Acworth, M. A. London: John Murray. 1891. Octavo, pp. 14 + 378.

Mr. Acworth's book is considered at length in another column of this issue, therefore no review of it is made here. The subject is treated under the heads of "Principles," "Practice" and "The Problem for Parliament." The actual and the proper bases of rates are considered under the first head. Under the second head are given examples and discussions of actual rates and methods of handling freight in England, on the Continent and in the United States. Under the third head the proposals for reform of the English system are dealt with in detail.

TRADE CATALOGUES.

The Marion Steam Shovel Company's Catalogue of Barnhart's Steam Shovels, Wrecking Cars, etc. Marion, O. The Marion Steam Shovel Company has issued in this a very handsome catalogue showing illustrations of steam shovels and wrecking cars, railroad ditchers, ballast unloaders, ditching dredges, river and harbor dredges, etc. Besides descriptions of these machines, lists of users and many letters of testimonial are given. In the introduction a table is given showing the sales by years, which gives an idea of the great increase in the business of the company. In 1885 five excavating machines and nine ballast unloaders were sold. In 1890 the sales were 58 machines and 143 ballast unloaders.

Information for Electrical Engineers and all Builders of Electric Street Railways and Electric Lighting Plants. By Milliken Brothers, New York and Chicago.

The information seems to be confined entirely to poles for carrying electric wires. These, with their attachments, are illustrated in great variety. A photograph is shown of one which is said to be the largest street railroad pole in the world; it has a bracket arm 38 ft. 8½ in. long.

Perkins & Co., Grand Rapids, Mich., have issued a small pamphlet describing that extremely useful tool for pattern makers, the "drawstroke trimmer." Probably few tools have for years been put into the pattern shop which have done so much as this one to decrease the annoyance of bad glue joints and the cost of patterns. The pamphlet contains many letters of approval.

Tunneling Under Heavy Pressures—Vacancies Affecting the Arch Work.

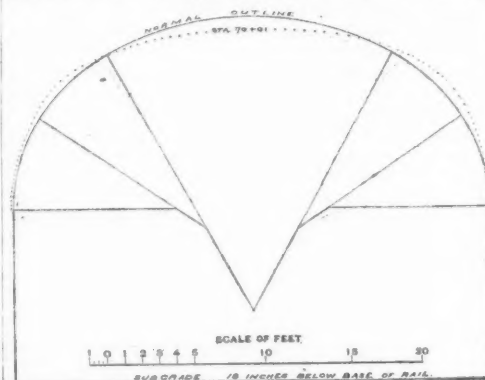
BY ARCHIBALD A. SCHENCK.

The many cases of failure or deterioration of arches in soft ground, sometimes occurring many years after the completion of the arch, indicate that closer attention is required somewhere in order to meet more closely, if possible, the demands of soft tunnel work. The various systems of temporary tunnel support required during the progress of the work have been almost exhaustively treated by Drinker. The importance of such timbering, the risks attendant upon it and the urgency felt by railroad companies to drive such work and get trains running, have tended to prevent engineers from giving as much time and study to the construction and the conditions subsequent to the timber work as they might otherwise have done. The fact that an engineer who has been on a construction, and is familiar with its hidden features and conditions, has also seldom been on the same work many years later, when its defects have become a matter of interest, has prevented a proper study of the connection between minute cause and serious effects, which might have resulted in conclusions of value.

Some study has of course been given to the arch details, but by no means as much as to timbering systems. A third branch of the subject has received still less study—namely, the conditions that exist, or may be ex-

pected to exist, as the years pass by, around the completed arch. These conditions are what determine more or less the arch work, and when studied will require a working backward to a subsequent examination of the arch construction and of the system of timbering. There are two directions, in which these outside conditions, being susceptible of modification by man, deserve special study, namely, in the lines of vacancies about the arch, and of the permanent drainage required for it (the latter including vacancies caused by flow of water).

The history of arch deterioration in soft tunnel work shows, as would naturally be expected, that in nearly all cases there is unequal loading of the arch. (Cases of



swelling ground, with terrific inward pressures from all directions, as in the Cristina and Sydenham tunnels, are a class by themselves, requiring greatly different study and treatment.) What should be aimed at in soft tunnel work is best noted when we consider the conditions under which arches built in the open to sustain proposed embankments are loaded and are left. In such cases, the greatest care is taken to load them equally, and after being loaded, the material over them, being a bank open on two sides, has ample drainage. There is no reason why every effort should not be made to establish similar conditions for an arch built under its proposed load, so far as reasonable expense will permit.

An important consideration to be kept in mind in studying what may be termed the "extrados conditions" of the work is that a very few inches movement of a part of the arch is sufficient to cause arch failure. A study of the distortion of the West Point tunnel arch, of which the section given is a type, shows that a very few inches outward movement of the haunches was sufficient to cause practical failure. Therefore it is not necessary, for arch failure, to have cavities several feet in size about the arch.

If there is reasonable ground for belief that vacancies of only a few inches exist, then there is reason for fear concerning the permanent stability of the arch. On the other hand, large cavities may exist under certain conditions and yet be, at least for a long time, not at all dangerous. Such cavities are those left by drawing forward the crown bars in the English system.

In none of the sections of the West Point tunnel distortion is there any evidence that the arch has risen into these cavities, or that the intermediate packing walls have unduly concentrated the load and forced down the arch immediately under them below the general line of settlement. The settlement has been practically uniform, both under cavity and under packing. The timbering was practically the same as shown by Drinker for the Musconetcong tunnel. The arch was generally keyed in seven or eight rings, the haunches averaging eight rings, the bars there being struck. In such cases, so far as distribution of the load sufficiently is concerned, the packing walls between drawbars are ample, and no injury results on this score from the drawing of the crown bars, and no rise of the arch takes place, at least for a flat arch, into these cavities more than elsewhere.

When the small amount of change in the arch sufficient to cause failure is considered—a few inches—it is safe to conclude that no packing under the lagging, whether dry or of rammed concrete, amounts to anything in neutralizing the effects of cavities in distorting the arch. In dry packing it is almost impossible to make it as tight and of supporting effect equal to that of the intermediate rigid bearings. If of irregular stones or bats, the bearing points of this packing against the lagging are necessarily only the few angularities that touch the lagging. These points may be sufficient to resist the nearly horizontal thrust by which, at a great mechanical disadvantage, it is sought to make the packing tight, but they amount to nothing as bearings for great pressures. The tendency of the dry packing is to roll and settle and fall away from the lagging. As for rammed concrete packing, its own weight tends to draw it away from the lagging, and it is safe to say that no concrete packing placed from below ever yet remained more than a few minutes in contact with an overlying surface it was intended to support. Nothing but carefully laid, solid cement masonry or a completely grouted dry packing, regouted several times, can be assumed to be a sufficiently close packing to secure its portion of the load and be an actual packing.

Keeping in mind the few inches only of vacancy required to cause arch failure, three concentric rings or

locations exist where vacancies may practically exist sufficient to cause serious trouble.

1. The ring occupied by the lagging that is left in. Although generally thought of as a single line of solid plank, it generally consists of a miscellaneous collection of stuff which, when it has rotted, can readily give several inches of leeway for the arch to move into. The filling of vacancies caused by rotting is not necessarily by the backing or earth dropping into them. Owing to a possible temporary cohesion of the earth behind the lagging, this earth may be stationary and the movement to fill the vacancy may come from the arch, especially if the drier under surface of the lagging rot first. The arch may be considered as a thing ever ready to move in any direction whither unequal loading will permit. Moreover, if the earth and not the arch be relied upon to move into the vacancy, a serious evil still results, as will be mentioned later.

This "lagging vacancy" caused by rotting is one of the most difficult evils to counteract. Possibly it may have to be in part borne with, and some chances taken; but the use of very thick lagging, or many layers of it, should be avoided as far as possible by the use of more numerous roof bars in the English system, or of bents in the other systems. It is also an argument in favor of building in the bars in the English system that they can be conveniently brought nearer together, and the lagging kept there, by some care in shaping the bearing ends of the roof bars. Possibly the slabs could be taken off the sides and bottom of the bars (the top being left round for the lagging), the space almost needlessly occupied by the side slabs being better filled by cement masonry in packing.

2. The next ring or location of possible vacancy is in the disturbed or excavated ground outside of the lagging. It is greatly in favor of other systems than the English, that the lagging in the former goes in longitudinally instead of laterally, with less disturbance of the outside ground. In the English system, as has been referred to by Drinker, the lagging of the haunches going in in a direction at first nearly tangent to the circle and then swung around to the circle, necessarily excavates material outside of the permanent position of the lagging, and causes a vacancy of several inches at the haunches. The ground may remain arched, leaving this vacancy here permanently, while at the crown we have a heavy pressure on the lagging and arch. The West Point tunnel arch shows so uniformly an outward movement of the haunches and a drop of the crown, that it is safe to infer that this extra-lagging vacancy, together with the flat form of the arch, has been an important factor in the failure. Another way in which extra-lagging vacancies are caused is when the haunch bars are struck, from the upper course of lagging bearing on the upper ends of the next course below. This lower course has been bricked against, but not up to the lap or the full length of the lower course. The lower course is therefore tilted on the upper edge of the brickwork, throwing the lower end out and making a vacancy.

In the former case, and sometimes in the latter case, even where earth follows the inmoving part of the lagging, this earth may be loose and not effective as a counterweight for the heavy crown pressures. Tunneling under heavy pressures does not mean a distinct and heavy pressure upon each and every square inch, or timbering work could hardly be forced ahead. The same natural arching of material that assists the advance of the timbering may act unfavorably on the permanent work by permitting unequal pressures.

These small vacancies either from rotting lagging or from movements of the lagging (or runs of material), although of only a few inches, may in time be the cause of immense pressures upon the arch. Earth having dropped into the few inches of these small vacancies, the vacancy thus caused above must be again filled by earth from above, and before this operation is completed a very great height of material loses its natural cohesion, and pressures upon the arch result very much greater than any encountered in the original construction. This natural cohesion of the earth is something that should be almost sacredly guarded as far as possible, for it can never be replaced. The most successful and permanent soft tunnel constructions may ultimately be found to be those where the timbering and excavation is done with greatest nicety with reference to this.

For filling these cavities outside of the lagging after the construction of each few feet in elevation of the walls and arch, grout should be run in behind the lagging. In the Heinzkyllen, the Mettericher, the Looskyller and the Nitteler tunnels, in Prussia, such grouting was done, as stated in a recent magazine, after the completion of the arches, at prices ranging from \$1.50 to \$3.13 per square yard. What it has been found desirable and practicable to do after an arch is built, it is certainly more desirable and less expensive to do during construction. The soaking of the grout into the soil, judging from the writer's experiments in that direction, will not be great, or result in waste of grout. This grouting will bring the arch construction out to where the ground retains its natural cohesion, and will unify the whole.

There is another extra lagging vacancy that should receive careful attention. This is the upper part of the top heading above the centre drawbars. The only time when this vacancy can be even moderately well closed is after the two bars have been drawn and are being lagged. It should be done with cement masonry. This

creates less disturbance of the ground than leaving the top of the drift to drop upon the crown bar lagging. In a high arch the top vacancy can readily start a rise of the arch, having something of the injurious effect of a shaft. If not well filled it also forms the basis for a waterway most injurious to the whole arch.

There are other causes, originating, however, within the lagging, for vacancies outside of the lagging or for loss of natural cohesion of the soil. The vacancies left by the drawn bars are one of these. We say vacancies, for we doubt whether any such spaces left between packing walls have ever, as a matter of fact, been actually packed full. Drinker speaks of sending a man into these spaces to pack them tightly with broken rock or pieces of plank, but he also says that the brick packings, as soon as the weight came upon them from the bars being drawn, were ground into fragments. At the West Point tunnel (built under the same superintendent as Drinker's Muscatetcong tunnel and at company expense) we found no men willing to go into these vacancies. By noting the small space left between drawbar ends and a packing wall, it will be seen that the room is small either for passing a man and materials in or for tamping from the outside. As for the part immediately in the rear of the bar, this must necessarily be done from the outside and always very imperfectly. The only thorough filling of this crown bar vacancy would be by putting a dam behind the end of the drawn bar after all possible loose packing had been put in, and pumping in grout in successive doses until the whole space was filled. In such case the system of drawing the bars would be better than building them in. Otherwise Rutter's plan of building them in is better for the permanence of the work, provided the bars are small and close together, and covered on top so closely and compactly with cement masonry that when they rot, material will not drop into the vacancy, and that lines of dry work be left under them for drainage. If not so covered, and material can drop in ultimately; and also in the case of drawn bars. If material can drop into vacancies left, then either vacancies will form above into which the whole crown can be forced upward, or the cohesion of the crown earth will be lost, and heavy pressures result.

Between the bars, for the same reason, in place of dry packing walls, solid cement work should fill all the spaces, with proper provision for drainage.

There are two other minor items which, although not causing vacancies immediately behind the lagging, have the same injurious effect of causing a loss of the cohesion of the ground above. The first is the settlement of the forward end of the bars, the other is a settlement of the rear end as it rests on the arch. Good judgment about the props and care and watchfulness about footings and wedges will prevent settlement in the lighter pressures, and prevent these pressures from becoming heavy. In the very heavy pressures the damage is generally already done and the earth has lost its cohesion for a great height. For the rear ends, Rutter's method of having them upheld by supports independent of the arch is better, not only for the arch but for the material over the arch. Although in general the new arch and its centres may support the heavy pressures on the bars without much yielding, yet there may be spots of extreme pressure that overthrow previous calculations and cause a settlement. In West Point tunnel one end of one section settled 4 in. under the bar pressure. The few inches additional play given the superincumbent earth by such settlement may affect great masses and create permanently heavy pressures for the arch to carry.

3. Outside of these vacancies about the lagging is another region of possible trouble. This is from a possible lateral compression of the material back of the haunches. This material, not being compressed towards the arch by the weight of the earth above as it is at the crown, may admit of lateral compression. If it does, it may not require a heavy outward pressure to force it sideways several inches, enough to produce arch failure. One special case of this possibility is where there has been a rock enlargement for a wall and haunch. Material sufficient to require bars and lagging may have worked down after blasting, probably will from the jar, but yet in so loose and untamped a condition that it is compressible. This film of compressible earth is most likely to exist at the lap where the timbering is carried down below the top of the rock ledge to form a tight junction.

For such cases of compressible material and for the general possibilities of unequal loading of the arch from inclined strata, variations of material, cavities due to water flow, etc., perhaps there is only one thing to consider. This is to admit at once that the situation is not one adapted to an arch pure and simple, and to endeavor to introduce other elements of strength into the structure.

One of the leading reasons for the great strength of the Austrian system of timbering is the cross stretcher near the spring line. This keeps the two wooden abutments apart. In the finished arch the substitute for this is a certain supposed arch pressure which may be largely imaginary, because unevenly distributed. The stretcher being impracticable in the finished arch, the only other substitute for it and a tie appears to be the retaining wall principle—use heavier abutments and carry them well up above the spring line. This will leave the arch less work to do as a lateral strut. Such a change is, of

course, an increase of expense, unless the otherwise probable expense of rebuilding the whole arch be a consideration.

Another mode of strengthening the arch is to build within the masonry of the arch iron ribs or centres. Such centres have been used as temporary centres. They have also been used at West Point to assist the failing arch, being built below it. They are of 15-in. channel, 174 lbs. per yard, placed 30 in. between centres. They may last 8 or 10 years as so exposed. If built in new arch masonry, they would be permanent, would tend to hold the arch in proper form and give it greater ability to carry unequal pressure. The form of section could be altered, clearance not being an element of consideration.*

The time of the arch work, which in brick for double track tunnel may be said to be a day for abutments and two for the arch, would be lengthened by the inserting of these ribs perhaps a half day. It is about time, however, that engineers demanded more time for thoroughness on so difficult and delicate a sort of work as soft ground tunneling. Too rapid a record should be objected to as reckless and unbusiness like. Renewals are too expensive, and a few weeks' or months' earlier opening of the work may be dearly bought. The fact that these difficult tunnels are generally the determining ones in the opening of the road causes them to be made "rush jobs." But with deliberate work in timbering, using care not to arouse the sleeping lion of heavy pressures, proper expense in a substantial and tough arch, and thoroughness in grouting everything about the arch to a compact condition, the list of soft ground tunnel failures may be prevented from growing at the rapid rate of the past.

TECHNICAL.

Manufacturing and Business.

The Chesapeake & Ohio shops recently erected at Clifton Forge, Va., will be in operation about the middle of May. The shops will, it is stated, employ 2,000 men at the start.

The Standard Bridge and Boiler Works, with a capital stock of \$100,000 has been incorporated at Bellaire, O., to manufacture steel and iron bridges and steam boilers. J. E. Jarold is General Manager of the company. Work has been commenced on the buildings and the machinery has been ordered.

The cars recently contracted for by the Chesapeake & Ohio with the Ensign Mfg. Co. and the Barney & Smith Mfg. Co. are to be equipped with the Butler drawbar attachment, and the new cars for the Wheeling & Lake Erie are also to be equipped with the Butler drawbar attachment.

George K. Paul & Co., 98 Milk street Boston, has assumed the general eastern agency for the sale of the Foster pressure regulators and reducing valves, manufactured by the Foster Engineering Co., of New York.

The main building of the new rolling mill for the Washburn & Moen Mfg. Co., at Waukegan, Ill., will be 140 ft. in width by 400 ft. in length, and will have a wing on one side 40 ft. in width and 180 ft. long, and one on the opposite side 40 ft. in width by 100 ft. long. The building will be entirely of steel, designed and built by the Berlin Iron Bridge Co., of East Berlin, Conn.

The Bowne Pneumatic Signal Co. has recently been organized at Baltimore, Md., to introduce the patent pneumatic railroad crossing signal invented by R. T. Bowne, of Harvard County. The President of the company is R. T. Bowne; Vice-President, J. C. Gittings; Secretary, A. R. White, and the General Manager, C. L. Howell.

Mr. C. H. Odell, Sales Agent for Carnegie Brothers & Co., Ltd., of Pittsburgh, and the Edgar Thomson Steel Works, has removed the New York office of the firm to the Bank of America Building, 44 Wall street.

Iron and Steel.

The National Malleable Iron Co., of Peoria, Ill., has been incorporated to manufacture malleable iron and machinery. The capital stock is \$100,000, and the incorporators are A. Henry, A. C. Angier and George A. Willson.

Alexander Loughlin, of Pittsburgh, formerly Vice-President of the S. R. Smythe & Loughlin Co., has entered into a new partnership as engineer and contractor for iron and steel works. His chief engineer is Josef Reuleaux, M. E.

The Rail Market.

Steel Rails.—There is very little change to note in the market, but it is believed that many of the larger companies will place heavy orders in a few weeks. The quotation of \$30 has been kept firm. The Pennsylvania order was given out this week. It is for 30,000 tons at \$30 at mill. The order was divided between the Pennsylvania Steel Co., Cambria Iron Co., and the Carnegie Pittsburgh Works.

The Slide Railroad in America.

The Société des Chemins de Fer Glissant, of Paris, France, has made application for permission to erect a 2-mile track on the exhibition grounds at Chicago for the purpose of showing the "slide railroad" which will be remembered as that which was running at the Paris exhibition in 1889. The cars slide on a film of water and are propelled by jets of water thrown out from pillars erected along the track. The device was described in the *Railroad Gazette* of Aug. 9, 1889.

The Ventilation of Tunnels.

Tunnel ventilation, with special reference to the three great Alpine tunnels, is elaborately discussed in the *Journal of the Austrian Society of Engineers and Architects*, of Feb. 6, 1891, by Josef Pürzl, Assistant City Engineer of Vienna. Mr. Pürzl points out that the aim in every rationally designed ventilating arrangement for tunnels is to utilize natural forces for the movement of the air, and that only when these prove insufficient or cannot be made available, mechanical means are resorted to. Accordingly, a knowledge of the laws of these forces alone can aid in determining the

*As for form of bond I have seen no reason to modify the form favored in my article in the *Railroad Gazette* of April 23, 1886.

expediency of heavy or light tunnel grades, and the question of the admissible length of tunnel in which there is to be no artificial ventilation. Barometric and thermometric differences are the prime factors in the problem. To these must be added atmospheric motions or winds.

Mr. Pürzl, starting with this basis, enters into a long mathematical discussion of the laws of natural ventilation, and applies them to the St. Gothard, the Mont Cenis and the Arlberg tunnels. Of these only the Mont Cenis tunnel is provided with mechanical ventilation.

It was expected that with the difference in level between the ends of the tunnel of 133 meters (about 436 ft.) there would, under all possible conditions, be a continuous current of air through the tunnel from north to south. This expectation, however, was not fulfilled, and provisions were therefore made for artificial ventilation. While the condition of the atmosphere in the tunnel was not dangerous to passengers, it proved troublesome to the workmen. An 8 in. pipe was laid between the tracks from one end of the tunnel to the other. It was supplied with air under pressure from the Italian end, and was fitted at intervals with cocks from which the air could escape. This arrangement is presumably still in use.

In the matter of grades in tunnels Mr. Pürzl directs attention to the circumstance that with a heavy grade much smoke will be emitted during up trips, and practically none during down trips, and that the latter, therefore, are always the more agreeable ones, although the motion of a train on a down trip frequently interferes with the natural current of air, which is in an upward direction. His conclusion, in the main, is that for large tunnels the lightest practicable grades are advisable, and that tunnels even longer than any now existing could be operated by having light grades and natural ventilation.

Electric Light and Power in Switzerland.

Electric light and power installations have multiplied in a remarkably rapid manner in Switzerland. At the close of 1889 there were 351 lighting plants, employing 408 dynamos, and supplying 51,155 incandescent and 845 arc lamps. Several central stations employ the alternating current. Motive power is furnished in 177 plants, or 50.4 per cent. of the whole number, by hydraulic motors; in 138 plants, or 39.3 per cent., steam engines are used, and in 32 others, or 9.1 per cent., there are gas engines. Four plants are said to use electric light motors, but no particulars are given to further explain this statement. There are further said to be in use 41 batteries of electric accumulators for lighting.

Of power transmission plants there are 24, the power transmitted varying from 2 to 23 H. P., and the distance between the generating and receiving stations ranging between 540 and 9,500 meters (about 1,771 and 31,160 ft.)

Mandrel-Rolled Hollow Staybolts.

The patented process for rolling these bolts is described by the makers, the Falls Hollow Staybolt Co., of Cuyahoga Falls, O., as follows: Two pieces of iron rolled in U-shaped section are laid together and wired in that position. These parts are then heated to a welding heat and run through rolls. As the welded tube comes from the rolls it passes over a mandrel, which fills the interior. Before reaching the second pair of rolls it cools slightly and shrinks upon the mandrel. In the second pair of rolls it is drawn from the mandrel and the interior cleared from slag and cinder. In this way, by five repeated operations, a hollow staybolt is obtained, which has a uniform interior diameter. The material is Tennessee bloom charcoal iron and is made in lengths of about 6 ft. and from $\frac{1}{8}$ in. to $1\frac{1}{2}$ in. outside diameter, with any size hole desired, from $\frac{1}{8}$ in. to $\frac{3}{4}$ in. A considerable saving in expense can be made by using hollow staybolt iron instead of drilling the ends of the bolts after they are in position.

A New Train Speed Indicator.

A new form of apparatus for registering speeds of railroad trains, devised by M. Sabouret, of the Orléans Railroad, France, is described in the *Avenir des Chemins de Fer*.

It is based on the use of a tuning fork sounding the note of A natural, and making 435 vibrations per second. One of the prongs of this tuning fork is provided with a stylus in the well known way, and inscribes its vibrations on a sheet of paper coated with lamp-black and mounted on a cylinder. The latter is driven by clock work. If, in such an apparatus, the fork and the cylinder carrying the diagram paper can be set in motion by a train, and can again be stopped after a certain known distance has been passed over, it is clear that all the data for determining the train speed are made available. In M. Sabouret's device the tuning fork and paper cylinder, together with the necessary clockwork, are fitted in a comparatively small case placed in the road bed. Four small pedals are arranged along the track, and are connected with the case by rubber tubes. One of the wheels of the locomotive, in passing over these pedals, compresses the air in the rubber tubes. This sets the operating mechanism in motion, and the registration of the vibrations of the tuning fork commences. After the locomotive has covered a distance of six meters, one of the wheels comes in contact with the last of the four pedals, and the compression of the air in the corresponding tube stops the operation of the apparatus. It remains then simply to determine the number of vibrations recorded during the intervals. Dividing this number by the known number of vibrations which the fork makes in a second will give the time which has elapsed between the starting and the stopping of the mechanism, and, consequently, the speed of the engine. The error of the device is said to be about 2 per cent. at a train speed of about 60 miles per hour. Fixing the apparatus to the rails and road bed is stated to take only about 10 minutes, and the apparatus itself is said to be almost invisible, so that train speeds can be determined without attracting the attention of an engineer on a locomotive.

THE SCRAP HEAP.

Notes.

The special agent of the Interstate Commerce Commission, who looks up violations of law, is in Montana.

At Gainesville, Tex., last week three alleged spotters were driven out of town by the railroad men. It is said that personal violence was done a spotter at Temple, Tex., not long ago.

The Post-Office Department announces the capture of nine of the bandits who robbed a mail car near Brownsville, Tex., last January. Another one was killed and two others are in jail in Mexico.

A San Francisco paper says that passes granted Southern Pacific employees, good for themselves and families, have been greatly abused, and that now the employees

will have to pay \$1 per quarter for a ticket good for the employe and wife, son or daughter.

A large number of damage suits has been entered in the Superior Court, of Cobb County, Georgia, against the Western & Atlantic Railroad for failure to deliver freight consigned over the Marietta & North Georgia during the recent strike of locomotive engineers.

Foreign Notes.

The city of Prague, in Hungary, is shortly to have two short cable roads working on inclines. They are to be, in a measure, gravity roads, an unbalanced weight of water in the cars at the upper terminals furnishing the motive power.

According to St. Petersburg reports, preparations are being made on Russian railroads to increase the carrying capacity of freight cars from 600 pounds (about 21,000 lbs.) to 750 pounds (about 27,000 lbs.). This, it is thought, will help to develop export trade and bring about lower freight charges.

A ship canal, to connect Venice with the Gulf of Spezia, is now under consideration in Italy. Its length, according to present estimates, would be 273 kilometers (about 170 miles) and its average breadth 75 meters (about 246 ft.). There will be in all 73 locks, and the cost of construction is estimated at about \$200,000,000.

The Swiss federal railroad department has requested the various railroad managers of Switzerland to consider the question of lowering passenger rates. The rates now in force are said to be practically the same as those adopted about 40 years ago. It is thought that the diminution in receipts, which would be brought about by the proposed reduction, would be more than counterbalanced by the increase in traffic expected to result from the adoption of such a measure.

With reference to the proposed plan of furnishing pillows to night passengers on Swiss railroads, the annual report of the Zürich Traffic Association says that the scheme, as tried on the railroads of Saxony, has given a negative result. The distances are too short, and the night service is not sufficiently developed to make the plan even self-sustaining in the matter of expense. It is suggested, however, in a Swiss paper, that some arrangement might be made with the larger hotels at places like Geneva, Zürich and others, by which these could be induced to take the matter in hand with satisfactory results to themselves as well as to the railroad passengers. A system of interchange, it is thought, could be effected between the different hotels, so that departing passengers could make a deposit for a pillow at the starting point, and, after reaching the end of the night's journey, could, by delivering the pillow, have the money so deposited refunded, minus a small amount to pay for its use.

Railroad Building in Guatemala.

Edward L. G. Steele, of the firm of Steele & Co., of San Francisco, Cal., President of the Champerico & Northern Transportation Co. of Guatemala, has sent a party of surveyors to Central America for the purpose of locating a proposed extension of the line now being operated between Champerico and Retalhuleu. This road is 26 miles in length and extending through a rich coffee district. The present owners propose to build an extension of 40 miles, reaching the interior town of Quetzaltenango and traversing the rich coffee fields of Northern Guatemala.

An Imposter.

General Manager J. M. Toucey, of the New York Central & Hudson River, sends out notice that a person named W. H. Morris, alias W. H. Wood, has been presenting forged applications for passes on spurious New York Central letter heads. Reports of the fraud have been received from points all along the Pacific coast from Oregon southward, and from places in Texas.

New Round House.

Work on the new Chicago & Grand Trunk round house to be built at Port Huron, Mich., will be begun as soon as the masonry and brick can be obtained.

The Morrisburg Canal Improvements.

The canal enlargement contracts have been let in three divisions, known as sections Nos. 1, 2 and 3; Nos. 1 and 2 to Messrs. Poupore, Fraser & O'Brien, and No. 2 to the Weddell, McAuliffe & Grass Dredging and General Contracting Company. The work to be done extends from the present lock at Morrisburg, Ont., west three and one-third miles, and is chiefly the enlargement and deepening of the prism of the canal, the formation of a regulating weir, construction of retaining crib work on the river side of the bank, building retaining walls of masonry, construction of a lock on the outer side of the old lock, and the lining of the inside of the banks, etc., etc., involving also the removal of the present government wharf, the construction of a new and much longer one, the piercing of dumping grounds, the building of a side wall on section No. 1, on the north side of the canal, etc. The outlay for materials and labor of these contracts will be in the vicinity of \$2,000,000.

A New Detroit River Tunnel Project.

Application has been made to the Ontario legislature for an act to incorporate a company with power to construct tunnels suitable for railroad purposes from the towns of Windsor and Sandwich, and townships of Sandwich East and Sandwich West, in Essex County, Ont., under the Detroit river, westerly to the boundary line of the Dominion.

A Comprehensive Argument.

A delegation of employes of the Chesapeake & Ohio called on President Ingalls at Richmond, Va., last week and asked for an increase of wages. Mr. Ingalls told them that although the company was doing very well now it could not afford to advance wages until it had time to make up for past losses.

Speed of Trains in the Fourth Avenue Tunnel.

The New York State Board of Railroad Commissioners has withdrawn its restriction as to speed of trains in favorable weather in the Fourth Avenue tunnel, New York City, on condition that the road station a man at each home signal with torpedoes to put on the track when the signal is set at danger, and with instructions to go back to warn following trains, should a train become stalled near the home signal, and upon the further condition that duplicate low signals be constructed between the tracks (on the right hand side of the track for which they give indications), so that both the engineer and the fireman can see them.

Annual Report of Iowa Railroad Commissioners.

The annual report of the Iowa Railroad Commissioners shows a net increase of earnings of \$2,180,539 for 1890 over 1889. The number of roads in receivers' hands was

six in 1888, five in 1889, and one in 1890, the Minneapolis & St. Louis. The total number of people killed on railroads in Iowa during 1890 was 131, and 747 were injured. The gross gain in miles of road built was 126; loss by tracks taken up, 60; net increase in mileage in the state, 66. No recommendations as to further legislation are made by the Commissioners.

Proposed New Ocean Steamships.

A report is current that the Inman Steamship Co. proposes to build two new steamships having a tonnage of 12,000 tons each and to be 600 ft. long and 65 ft. wide. It is stated that both ships will be built in America to take advantage of the terms given by the postal subsidy bill to American-built steamers. The Cunard Co. has invited tenders for two ships with similar dimensions and like the Inman ships, intended to cross the Atlantic in five days.

Picked Six-footers on the Royal Blue.

Pullman dining cars are to be run over the Royal Blue Line, on trains leaving New York at 11.30 and 3.30, and Washington at 10 and 5. The china-ware will be decorated in royal blue, making it both unique and attractive. The stewards will all be picked men, each over 6 ft. in height.

Railroads in Tunis.

According to the *Journal des Transports*, the railroads of Tunis at present comprise: (1) A line from Tunis to Goulette, about 22 miles long, belonging to an Italian company and aided by an Italian government subsidy; (2) a French line connecting Tunis with the Algerian railroad system; (3) a line built in 1882 by the War Department, and connecting Sousse and Kairuan; a 12-mile road connecting Tabarka and Cape Serrat. Strictly speaking, only the valley of Medjerda has means of rapid communication between different points. With the improved financial condition, however, the government is now in position to undertake the construction of an extensive network of railroads throughout the country. A main line running north and south is proposed, and from this various branches are to lead off to accommodate the requirements of adjoining districts. There are to be altogether about 220 miles of road.

Then and Now.

Under the old management some one or two years ago a special train of one car went from Salt Lake to Eureka to carry a carload of Odd-Fellows, who went to institute a new lodge. For this the company was paid \$75. It was recently proposed to organize a large party of ladies and gentlemen to go there on a similar occasion, and application was made to the Union Pacific for a cheap excursion rate, and \$3.50 was named as the lowest price per passenger, and this on the regular train, requiring two days' time. This is equal to \$175 for 50 passengers on the regular train, against \$75 for 50 on a special at the time of the former visit.

The Puget Sound Drydock.

The plans for the proposed United States timber dry dock at Port Orchard, Wash., on Puget Sound, are being prepared by the Bureau of Yards and Docks, of the Navy Department. The dock will be 600 ft. long, 70 ft. wide at the bottom of the entrance, and will be capable of admitting vessels drawing 30 ft. of water. The bureau will probably invite proposals for the work in a few months. Lieutenant A. B. Wyckoff will have charge of the construction of the dock.

Widening a B. & O. Tunnel.

The Baltimore & Ohio has commenced the work of widening the tunnel at Austen, Preston County, W. Va. This is the longest tunnel on the main line, being nearly two miles in length. It is built for double track and most of the way is arched with brick. For some time the south wall has been showing signs of weakness, and has been slowly moving in under the weight of the mountain. One track has been abandoned.

Subsidies to Ontario Railroads.

A statement has just been submitted to the Ontario Legislature showing the amounts payable annually out of the treasury of that province for certificates for "aid to railways" and "annuities." In 1891, \$252,174 is payable for railroad aid certificates and \$52,200 for annuities. These amounts rapidly decrease until 1930, when the only certificate remaining unpaid is that of the Fort Arthur, Duluth & Western. The amounts payable that year are \$4,612 for railroad aid certificates and \$52,200 for annuities. The total amount payable for certificates is \$1,404,620, and \$1,824,800 for annuities.

The Argentine Trans-Andine Railroad.

Argentine information says the Trans-Andine Railroad between Buenos Ayres and Valparaiso is open for traffic, with the exception of the distance between Mendoza and Uspallata, 56 miles, which is now traversed on mule-back; but the tunnel through the mountain is expected to be finished during the year.

LOCOMOTIVE BUILDING.

The Baldwin Locomotive Works have built 10 engines for the Mexican Inter-oceanic, which are being put together at the company's shops at Texcoco, Mex. Three of the consolidation engines are running in freight service.

The Bellingham Bay & British Columbia road has received several locomotives from the Baldwin Locomotive Works, and four others ordered at the same works are to be delivered in a few weeks.

A new passenger locomotive has been built at the East Buffalo shops of the Delaware, Lackawanna & Western. It has 19 x 24 in. cylinders, 200 2-in. flues and 3-in. boiler steel, and driving wheels of 62 in. diameter.

The Utah Central has just put in service on the heavy grade near Park City, Utah, a 40-ton Shea engine, built at the Lima Machine Works. It hauls 10 loaded freight cars up a six per cent. grade.

The Columbus, Shawnee & Hocking has let eight engines to the Rogers Locomotive Works.

The Richmond Locomotive & Machine Works is working on orders in its locomotive department for 10 heavy ten-wheel engines for the Chesapeake & Ohio, and 15 locomotives for the Louisville Southern and other roads. The firm has recently purchased a furnace for heavy forging and other important machinery.

The Long Island has let contracts for 10 locomotives, to be delivered by the middle of June. The order includes five 10-wheel engines for passenger or freight service, two standard passenger engines and three switching engines.

The Fort Worth & Rio Grande has received two new engines of the mogul type from the Rhode Island Locomotive works. They have the straight stack and extension front, and 19 x 24 in. cylinders. They will be used for freight service.

The following are the particulars of the tank locomotives building by the Canadian Locomotive & Engine Co., Kingston, Ont., for the Chignecto Marine Transport Railway. The engines have eight drivers, coupled, no trucks. The cylinders are 22 in. diameter and 26 in. stroke. The driving wheels are 47 in. diameter on the tread. Boiler, straight top, 59 in. diameter; working pressure, 175 lbs. per sq. in.; tubes, 256 in number, 2 in. diameter. Heating surface: Tubes, 1,741; firebox, 137; total, 1,878 sq. ft. Grate area, 29 sq. ft. Capacity of tanks, 3,000 imperial gallons, equal to 3,636 United States gallons. The total weight, all on drivers, is 180,000 lbs. Two of these locomotives abreast are to haul a vessel and cradle 17 miles, on a level and straight track, at a speed of 10 miles an hour. The weight of vessel and cradle will be about 2,500 gross tons.

CAR BUILDING.

The Long Island placed an order this week for 16 passenger cars, four combination passenger and baggage cars and 100 freight cars. All this equipment is to be delivered by June 25.

The Mexican Inter-oceanic is receiving 250 freight cars from England, all of which are equipped with the Westinghouse air brake. The first 100 of the order have been delivered in Mexico.

The Ohio Falls Car Co., has recently built 10 passenger cars for the Louisville Southern Division of the Cincinnati Southern.

The St. Louis & Suburban has placed an order for 120 cars with one of the local car-building firms. They will be cable cars, and will be used on the portion of the road now operated as a steam road.

The Southern Pacific will probably build about 1,000 cars this year. Part of the order will be let to private firms, but a large number of the cars will be built at the Sacramento shops.

Receiver Henning, of the Indianapolis Car and Mfg. Co., filed a report with the District Court at Indianapolis, on April 1, which stated that the claims against the company aggregated \$891,683, on which a dividend of seven per cent. was ordered to be paid.

BRIDGE BUILDING.

Belmont County, O.—The Ohio Legislature has passed a law empowering the County Commissioners of Belmont County to issue \$100,000 of the county's bonds, the proceeds to be expended on bridges in different parts of the county.

Fort Worth, Tex.—The new bridge to be erected over Trinity River, for which the contract has been given to the Lane Bridge & Iron Co., of Chicago, is to be built at a cost of \$14,750.

Hampton, Ont.—The contract for the steel superstructure of the new bridge at Hampton has been let to the Montreal Bridge Co.

Natchitoches, La.—It is reported that a new bridge is to be built across Cane River at this town.

Randolph County, W. Va.—The County Court of Randolph County, W. Va., will ask bids in two weeks for building three new steel highway bridges, one of 140 ft., one of 60 ft. and another nearly the same length, all to cross the Tygart's Valley River.

Roanoke, Va.—The American Bridge & Iron Co., of Pittsburgh, Pa., has, it is stated, received the contract for the construction of a bridge 644 ft. long over the Roanoke River, at Roanoke.

Schenectady, N. Y.—The bids for the new iron bridge over the Erie Canal at Church street, in Schenectady, N. Y., were opened this week, and the contract for the superstructure was let to the Hilton Bridge Co., of Albany, N. Y., for \$7,975. The other bidders was \$9,830, by W. H. Shepard, of Havana. The bids for the substructure were Flagler & Devlin, of Troy, \$3,110; James E. Flood, of Sandy Hill, \$3,958. The contract was awarded to the former.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulations of Railroads.

In Alabama the Supreme Court decided that the omission of a railroad company to repair a bridge across its track on a public highway, is not indictable under the Mississippi Code, providing that a person obstructing a highway in any manner shall be liable to indictment, for the statute contemplates a positive obstruction, and not a mere omission to repair.

In Pennsylvania the Supreme Court rules that although the terms "railroad" and "railway" are generally synonymous and interchangeable, yet it is evident from the way in which these terms are used in article 17 of the constitution, that "railroad" is applied to steam railroads, and "railway" to street railways; and therefore section 4 thereof, which forbids the consolidation by purchase or lease of any "railroad, canal, or other transportation" companies owning, or having under their control, parallel or competing lines, does not apply to street railway companies, and the latter, though parallel, will not be enjoined from consolidating.

In Minnesota the Supreme Court holds that where a railroad to whom land had been conveyed for terminal purposes, under an agreement that it should be reconveyed if not used in that manner in three years, in good faith begins the building of its road, lays a branch track on the land, and erects a small building thereon to be used as a railroad blacksmith shop, it sufficiently complies with the agreement.

In Wisconsin the Supreme Court decides that a walking boss for railroad contractors, whose duty it is to see that the subcontractors properly perform their contracts, and who has authority to compel them to keep sufficient men on the work to fulfil their contracts, can pledge his principals to pay the board bills of laborers for whom he obtains board upon his promise that the bills will be paid.

In Pennsylvania the Supreme Court holds that the rule exempting from taxation for local purposes so much of a railroad company's property as is indispensable to the construction of the road, and fitting it for use, does not embrace the railroad repair shops, and they are liable for township and school taxes.

Carriage of Goods and Injuries to Property.

In Iowa the Supreme Court rules that a common carrier is not liable for household goods seized while in its hands under an attachment against the consignor's husband, where it has notified the latter of the attachment on his presenting the bill of lading to its agent in time for him to assert the consignor's title to the goods before they are sold under the attachment, as it was entitled to rely on the presumption that he was the consignor's duly authorized agent in regard to the control of the goods, and it is immaterial by what means he obtained the bill of lading.¹

In Texas the Supreme Court holds that the station agent of a railroad company has authority to bind it by a contract to furnish cars at his station on a day specified.²

In Tennessee goods ordered over a fictitious name, with the intent not to pay for them, were delivered by the carrier to the person giving the order, upon his presenting an unindorsed bill of lading made out in the assumed name, and without requiring him to identify himself as the consignee or the consignee's agent. It is held that the carrier was liable to the consignor for the price of the goods.³

In Iowa the Supreme Court rules that a rebate secretly paid by a common carrier to certain shippers being an unjust discrimination against others shipping the same class of goods under the same conditions at the regular rate without debate, is illegal at common law.⁴

In New York the Supreme Court rules that an objection that the structure of an elevated railroad is not such as was authorized to be built, is available to the land-owner, in proceedings to condemn his easements in the street in front of his property.⁵

In Indiana though an abutting owner has by acquiescence lost the right to an injunction, or to bring ejectment against a railroad constructing a track along the street, he may have an action for damages.⁶

Injuries to Passengers, Employees and Strangers.

In Minnesota the Supreme Court holds that a round-trip excursion ticket used by the purchaser in going to the station named therein, and then sold and transferred, no restrictions appearing, is valid in the hands of the holder, and entitles him to a return passage, subject to the prescribed limitations as to time, etc.⁷

In Indiana the going coupon of a round-trip ticket provided that it would be void if detached, and the passenger presented both ends, and the conductor, by mistake, took the returning coupon when he should have taken the going coupon. The Supreme Court holds that this was a waiver of the condition on the going coupon in regard to detachment.⁸

In Michigan it appeared that the train ran past its usual stopping place at the station to which plaintiff was going, and that the engineer backed the train as quickly as he could operate the engine. On hearing the name of the station called, plaintiff got up and proceeded to alight, when, as she testified, the train suddenly backed just as she was stepping off, throwing her to the ground, and breaking her hip. Defendant contended that plaintiff attempted to alight while the train was backing, and, in support of this contention, introduced the evidence of other passengers, who were in the car behind the one in which plaintiff was riding, that they got off at the front end of their car when the train first stopped, and walked towards the rear of the train, a distance of 25 or 30 feet, when they were attracted by the fall of plaintiff, who had gotten out at the front end of her car, and turned and walked back about 10 feet to where she had fallen. The Supreme Court reverses a verdict against the railroad.⁹

In Minnesota the Supreme Court holds that where a person attempts to pass through the gate of a union depot company in violation of a rule of the company requiring all persons to show their tickets before passing through the gate to board a train, the gate-keeper may seize him, using no more force than is necessary, and make him show his ticket, even though he has succeeded in passing the gate.¹⁰

In Iowa it is held by the Supreme Court that one who uses the track of a railroad company by a mere license assumes all the dangers caused by a proper use of the track.¹¹

In Alabama the Supreme Court holds that a stranger who walks on a railroad track at a place other than a public crossing, and not in a town or village, is a trespasser, and the company is under no obligation to look out for him.¹²

In California a man, while walking along a railroad track without license, was run into and killed at a distance of 150 yards from a crossing behind him, from which direction the train was coming. The engine was in a reversed position, and there was no head-light or cow-catcher on the tender. The bell was not rung, nor was the whistle blown at the crossing, though required by statute. Had such signals been given he would probably have heard them and escaped injury. He was not seen by the trainmen until after the accident. The Supreme Court rules that the railroad is not liable.¹³

In Alabama, the defendant's employees detached some cars from their engine and allowed them to run down a considerable grade and collide with plaintiff's wagon as he was crossing defendant's track. There were no appliances on the cars to give warning of their approach, and the only signal given was the whistle of the detached engine. Only one brakeman was on the cars, and they ran at a rate greatly in excess of the maximum speed allowed by the city ordinance. The Supreme Court holds that defendant was guilty of gross negligence, and liable to plaintiff in damages, although plaintiff was a trespasser, and guilty of contributory negligence.¹⁴

In Michigan the Supreme Court rules that (in an action for injuries caused by a train of cars frightening a horse) the plaintiff, having taken his horse, which was young and unused to the place or cars, to the point in question, for the purpose of testing him, to see how he would act, was guilty of contributory negligence.¹⁵

In North Carolina the Supreme Court holds that when a train running at the rate of about 20 miles an hour runs over a man, who could have been seen by the engineer at a distance of three-fourths of a mile, lying apparently helpless on the track, the question of the company's negligence is for the jury.¹⁶

In Iowa the plaintiff was walking along the right of way between two tracks about 8 ft. apart, was struck and injured by a train backing toward him from behind. He had seen the train pass him while going forward, and knew that it could not go more than 1,000 ft. in that direction. A train on the other track prevented him from hearing the train that injured him, but he might have seen it had he looked around. The Supreme Court holds that he was negligent and the railroad is not liable.¹⁷

In Georgia the plaintiff's husband was walking on the track of the defendant company, but, though he could be seen for some distance, there was no blowing of the whistle or ringing of the bell, and no warning or attempt

to check the train until within a few feet of deceased, when the whistle was blown twice. The law provides that, if the plaintiff by ordinary care could have avoided the consequence to himself caused by the defendant's negligence, he is not entitled to recover. But in other cases the defendant is not relieved, although the plaintiff may in some way have contributed to the injury sustained. The Supreme Court rules that defendant was guilty of wanton and willful negligence, and that in such case decedent's want of ordinary care was no bar to recovery.¹⁸

- ¹ Vick-burg & M. R. Co. v. State, 8 South. Rep.
² Re Montgomery, 20 Atl. Rep. 390.
³ Clute v. Washburn (Minn.), 46 N. W. Rep. 355.
⁴ Cannon v. Henry, 47 N. W. Rep. 188.
⁵ P. & N. Y. C. & R. Co. v. Vandye, 20 Atl. Rep. 653.
⁶ Furman v. Chicago, R. I. & P. Ry. Co., 46 N. W. Rep. 1043.
⁷ Easton v. Dudley, 14 S. W. Rep. 583.
⁸ Sword v. Young, 14 S. W. Rep. 481.
⁹ Cook v. Chicago, R. I. & P. Ry. Co., 46 N. W. Rep. 1089.
¹⁰ In re Brooklyn E. R. Co., 11 N. Y. S. 161.
¹¹ Porter v. Midland Ry. Co., 25 N. E. Rep. 156.
¹² Carsten v. Northern Pacific Ry. Co., 47 N. W. Rep. 49.
¹³ Pennsylvania Co. v. Bray, 25 N. E. Rep. 439.
¹⁴ Sherwood v. C. & W. M. R. Co., 46 N. W. Rep. 773.
¹⁵ Dickerman v. St. Paul Union Depot Co., 46 N. W. Rep. 907.
¹⁶ Richards v. Chicago, St. P. & K. C. Ry. Co., 47 N. W. Rep. 63.
¹⁷ Louisville & N. R. Co. v. Black, 8 South. Rep. 246.
¹⁸ Toomey v. S. P. R. Co., 21 Pac. Rep. 1074.
¹⁹ Georgia Pac. Ry. Co. v. O'Shields, 8 South. Rep. 248.
²⁰ Cornell v. Detroit E. Ry. Co., 46 N. W. Rep. 791.
²¹ Deans v. W. & W. R. Co., 12 S. E. Rep. 77.
²² Richards v. C. St. P. & K. C. Ry. Co., 47 N. W. Rep. 63.
²³ Central R. & B. Co. v. Denson, 11 S. E. Rep. 1039.

MEETINGS AND ANNOUNCEMENTS.**Dividends.**

Dividends on the capital stocks of railroad companies have been declared as follows:

- Cincinnati, Sandusky & Cleveland*, 3 per cent. on the preferred stock, payable May 1.
Evansville & Terre Haute, quarterly, 1½ per cent., payable April 27.
Great Northern, quarterly, 1½ per cent., payable May 1.
Long Island, quarterly, 1 per cent., payable May 1.
New York & New England, 3½ per cent. on the preferred stock, payable May 1.
St. Paul, Minneapolis & Manitoba, quarterly, 1½ per cent., payable May 1.
Toledo & Ohio Central, quarterly, 1½ per cent. on the preferred stock, payable April 15; and 1 per cent. on the common stock, payable May 1.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

- Allegheny Valley*, annual, Pittsburgh, Pa., April 14.
Annapolis, Washington & Baltimore, annual, Baltimore, Md., May 4.
Atlantic City, annual, Camden, N. J., May 4.
Atlantic & Pacific, annual, 45 Broadway, New York City, May 21.
Austin & Northwestern, annual, Austin, Tex., May 6.
Beech Creek, annual, Jersey Shore Junction, Pa., May 8.
Burlington, Cedar Rapids & Northern, annual, Cedar Rapids, Ia., May 26.
Central of New Jersey, annual, Jersey City, N. J., May 8.
Central Ohio, annual, Columbus, O., April 29.
Chesher, annual, Keene, N. H., May 13.
Chicago, Burlington & Quincy, annual, Chicago, Ill., May 20.
Chicago, St. Louis & Pittsburgh, annual, Indianapolis, Ind., April 15.
Chicago & West Michigan, annual, Muskegon, Mich., April 15.
Cincinnati, Hamilton & Dayton, special, 200 West Fourth street, Cincinnati, O., April 27, to perfect a lease of the property and franchises of the Cincinnati, Dayton & Ironton road.
Cincinnati, Lebanon & Northern, annual, Cincinnati, O., April 14.
Cincinnati, Saginaw & Mackinaw, annual, Saginaw, Mich., April 21.
Concord & Montreal, annual, Concord, N. H., May 26.
Delaware & Bound Brook, annual, Trenton, N. J., May 28.
Delaware & Hudson Canal, annual, 21 Cortlandt street, New York City, May 12.
Denver & Rio Grande, annual, Denver, Col., May 26.
Detroit & Bay City, annual, Detroit, Mich., May 7.
Detroit, Lansing & Northern, annual, Detroit, Mich., May 13.
Flint & Pere Marquette, annual, East Saginaw, Mich., May 20.
Frederick, Elkhorn & Missouri Valley, annual, Chicago, Ill., May 22.
Harlem & Portchester, annual, New Haven, Conn., April 11.
Houston & Texas Central, annual, Houston, Tex., May 4.
Indianapolis, Decatur & Western, special, Indianapolis, Ind., April 23.
Junction, special, 22 Fifth avenue, Chicago, Ill., May 5, to act upon a proposed sale of the property and franchises to the Chicago & Northwestern.
Kansas & Arkansas Valley, annual, Little Rock, Ark., April 23.
Kansas City & Omaha, annual, Fairfield, Neb., May 5.
Lake Shore & Michigan Southern, annual, Cleveland, O., May 6.
Little Rock Junction, annual, Little Rock, Ark., April 23.
Little Rock & Fort Smith, annual, Little Rock, Ark., April 23.
Long Island, annual, Jamaica, N. Y., April 14.
Louisiana & Missouri River, annual, St. Louis, Mo., May 6.
Medicine Hat, special, Toronto, Ont., April 18.
Mexican Central, annual, Boston, Mass., May 6.
Michigan Central, annual, Detroit, Mich., May 7.
Missouri, Kansas & Texas, annual, Parsons, Kan., May 20.
Mohawk Valley & Northern, special, Vanderbilt avenue and Forty-fourth street, New York City, April 29.
Newport News & Mississippi Valley, annual, 18 and 20 Exchange Building, New Haven, Conn., April 11.
New York Central & Hudson River, annual, Albany, N. Y., April 15.
New York, Chicago & St. Louis, annual, Cleveland, O., May 6.
New York & Harlem, annual, Grand Central Station, New York City, May 19.

New York & Long Island, special, 22 State street, New York City, April 15, to authorize an increase of the capital stock.

Norfolk & Western, annual, Roanoke, Va., May 6.
Northern (New Hampshire), annual, Concord, N. H., May 28.

Ohio River, annual, Parkersburg, W. Va., May 14.

Ohio Southern, annual, Springfield, O., April 20.

Oregon & California, annual, Portland, Or., April 14.

Philadelphia & Reading Terminal, special, Philadelphia, Pa., April 21.

Pittsburgh, Cincinnati, Chicago & St. Louis, annual, 1003 Penn avenue, Pittsburgh, Pa., April 14.

Pittsburgh, Fort Wayne & Chicago, annual, Pittsburgh, Pa., May 20.

Pittsburgh & Western, annual, Allegheny, Pa., May 4.

Quebec & Lake St. John, annual, Quebec, Que., May 14.

St. Louis, Arkansas & Texas, annual, Texarkana, Tex., May 4.

St. Louis & San Francisco, special, Broadway and Pine street, St. Louis, Mo., May 7, to consider a proposed issue of bonds; and annual, May 13.

St. Louis Southwestern (Missouri), special, Room 14, Equitable Building, St. Louis, Mo., April 21.

St. Louis Southwestern of Texas, special, Tyler, Tex., April 15.

Shenandoah Valley, annual, Roanoke, Va., May 6.

Toledo, Ann Arbor & North Michigan, annual, Toledo, O., April 15.

Traverse City, annual, Traverse City, Mich., May 7.

Unadilla Valley, special, 80 Broadway, New York City, April 15.

Union Pacific, annual, 101 Tremont street, Boston, Mass., April 29.

Union Pacific, Denver & Gulf, annual, Denver, Col., April 14.

Utah Central, annual, Salt Lake City, Utah, May 4.

Valley (Ohio), annual, Cleveland, O., April 15.

Wheeling & Lake Erie, special, Toledo, O., April 15, to vote on a proposed increase of the capital stock.

Wisconsin Central, annual, Milwaukee, Wis., May 28.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Freight Claim Agents' Association of the West* will hold its next meeting at Kansas City, Mo., April 15.

The *Association of American Railway Accounting Officers* will hold its annual convention at the Southern Hotel, St. Louis, Mo., May 27, commencing at 10 o'clock a. m.

The *Master Car Builders' Association* will hold its annual convention at the Stockton Hotel, Cape May, N. J., commencing June 9, at 10 o'clock a. m.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, in the Gilsey House, New York City, at 2 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union Station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York. The annual convention will be held at Lookout Mountain, Tenn., commencing about May 30.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturday of each month, excepting in January, when the annual meeting is held on the second Saturday of the month. The second January meeting is held on the third Saturday. The club stands adjourned during the months of July, August and September.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month, at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first

Thursday of each month in the Public Library Building, Minneapolis, Minn.

Canadian Society of Engineers.

The Canadian Society of Engineers met at Toronto, week before last, to discuss Mr. E. L. Cortbell's paper on the proposed enlargement of the waterway, and the ship railroad between the Great Lakes and Atlantic seaboard. Mr. David Blair made a long address in favor of his scheme for a ship railroad from Sturgeon Bay to Toronto. He explained the advantages of such a structure over any enlargement of the Ottawa or deepening of the Welland Canal, and said: "At the point in Lake Huron, which has been described as the proper beginning of the 'Huronario' route there passes not less than 35,000,000 tons of freight yearly. From this point, under favorable conditions such as can be easily obtained, freight can be profitably carried to Liverpool for about three cents per bushel for wheat, while by all rail from Chicago to New York it costs over 30 cents per bushel delivered in Liverpool. The saving on this item in four years would more than pay for the entire cost of the works from tidewater to the head of the lake."

Engineers' Club of Cincinnati.

The regular meeting of the club was held on the 19th ult., 26 members being present. A. A. Daniels, A. O. Elsner, F. W. Wramplmeier, Wm. E. Dowson, Wm. H. Rabbe and Henry Dreses were elected to membership. The question: "Will a cut of 5,000 cu. yds. make a fill of 5,000 cu. yds. after a haul of from 500 to 1,000 ft.?" was discussed at considerable length. The paper for the evening, by W. H. D. Totten, comprised a description of the plants of the Edgar Thomson and the Homestead Steel Works of the Carnegie Association, of Pittsburgh.

Engineers' Club of Philadelphia.

A regular meeting was held March 21, President Wilfred Lewis in the chair, and 22 members and one visitor present. The Secretary made the following announcements:

That Mr. S. M. Prevost had resigned from the Vice-Presidency of the Club, and that Mr. David Townsend had been elected as his successor; that the Board had elected Mr. S. H. Chauvenet as Vice-President, in accordance with the enacting clause of the new constitution, and under the same clause Professor H. W. Spangler was elected the new member of the Board, and Mr. T. Carpenter Smith was elected Treasurer of the Club.

That the Standing Committees of the Board of Directors, as finally appointed by the President, are as follows: Finance, Messrs. P. G. Salom, F. H. Lewis and S. H. Chauvenet; Membership, Messrs. David Townsend, P. G. Salom and S. H. Chauvenet; Publication, Messrs. Rudolph Hering, John C. Trautwine, Jr., and Professor H. W. Spangler; Library, Messrs. George S. Webster, Rudolph Hering and P. G. Salom; Information and Entertainment, Professor H. W. Spangler and Messrs. George S. Webster and F. H. Lewis; and House, Messrs. F. H. Lewis, John C. Trautwine, Jr., and David Townsend.

The Secretary presented for Mr. Harry B. Hirsh an illustrated description of an iron sewer template which had been used in the construction of a cement sewer. Mr. Strickland L. Kness presented notes on the discharge of steam into the atmosphere through tubes of different shapes, with pressures from 30 to 120 lbs. per square inch. The results showed that for all pressures above 25 lbs. the velocity of discharge at any given section of a correctly proportioned tube was practically constant, and that under the same conditions the flow of weight was almost directly proportional to the initial pressure. There was some discussion of this paper by Mr. T. Carpenter Smith, Professor H. W. Spangler, Mr. Wilfred Lewis and the author.

New York Railroad Club.

The next regular meeting will be held Thursday afternoon, April 16, at 2 o'clock p. m., at the rooms of the club. Mr. George H. Paine, of the Union Switch & Signal Co., will read a paper on Block Signaling. Several experts are expected to be present and to take part in the discussion. The club will also discuss the Rules of Interchange with a view to suggesting amendments.

PERSONAL.

—Mr. S. S. Parker, Assistant General Passenger Agent of the Louisville & Nashville, died suddenly this week at Cincinnati.

—Mr. Charles Howard, Second Vice-President and General Manager of the New York & New England, has been elected First Vice-President of the company.

—Mr. John A. Grier, General Freight Agent of the West Shore Line, and for many years General Freight Agent of the Michigan Central, died at his home in Chicago.

—Mr. George R. Talcott, Superintendent of the Charlotte, Columbia & Augusta and Columbia & Greenville Divisions of the Richmond & Danville has sent in his resignation, to take effect April 10.

—Mr. Theodore L. Dunn, Chief Engineer of the Louisville, Evansville & St. Louis for several years, has resigned that position, and it is reported has accepted a position in the engineering department of an Eastern road.

—The North Carolina Railroad Commission held its first meeting April 1, the date on which the new law creating the commission was to go into effect. Major J. W. Wilson was chosen chairman. Mr. H. C. Brown, of Mt. Airy, was elected to the clerkship to the commission at a salary of \$1,200 per annum.

—Mr. P. J. Flynn, General Agent of the Rio Grande-Midland joint route between Denver and Salt Lake City, has been appointed Commissioner of the Colorado-Utah Association, composed of the Denver & Rio Grande, Colorado Midland, Rio Grande Western and the Union Pacific. Mr. Flynn was formerly General Agent of the Missouri Pacific at Denver.

ELECTIONS AND APPOINTMENTS.

Brookline.—The following are the incorporators of the company in New Hampshire: William G. Shattuck, James H. S. Tucker, David Hobart, Joseph A. Hall, Samuel Sweet, Charles E. Shattuck, Thos. S. Hittenger, Walter F. Rockwood, Gilman P. Huff, Ira Daniels, William A. Hobart, Albert W. Corey and Chas. A. Stickney.

Burlington & Missouri River.—J. P. Reardon has been appointed Master Mechanic of the Wyoming Division, with headquarters at Alliance, Neb., vice Jeffries Wyman, assigned to other duties.

California & Nevada.—A. M. Beale, formerly of the Atlantic & Pacific, has been appointed Superintendent of this company, and will have his office in Oakland, Cal.

Cambridge & Chesapeake.—The incorporators are: James Wallace, W. F. Applegarth, M. E. Gore, J. W. Bradshaw, W. L. Henry, Henry Lloyd, E. T. Mace, L. A. Insley and A. J. Foble. James Wallace is President and W. L. Henry, Secretary. The office of the company is Cambridge, Md.

Chesapeake, Ohio & Southwestern.—The following directors were elected at a meeting in Memphis last week: C. P. Huntington, Eckstein Norton, T. C. Platt, I. E. Gates, William Mahl, Gabriel Morton, John Echols, H. D. McHenry and Holmes Cummins.

Chicago & Alton.—The company held its annual meeting in Chicago this week. There were 127,500 votes polled out of a possible vote of 175,945, resulting in the election of John J. Mitchell, of St. Louis; William N. Blackstone, of Norwich, Conn., and Adolphus C. Bartlett, of Chicago, as directors for three years. At a subsequent meeting of directors, officers were elected as follows: T. B. Blackstone, President; J. C. McMullen, Vice-President; Charles H. Foster, Secretary and Treasurer; Charles H. Chappell, General Manager; William Brown, General Solicitor; Chauncey Kelsey, Auditor.

Chicago Railroad Association.—At the annual meeting of the Association, April 3, the following officers were elected for the ensuing year: President, Louis Eckstein, Wisconsin Central; Vice-President, O. W. Ruggles, Michigan Central; Secretary and Treasurer, A. F. McMillan, Michigan Central. The Executive Committee will be composed of George H. Headford, Chicago, Milwaukee & St. Paul; John S. Barrows, Chicago & Northwestern; and C. A. Cairns, of the Chicago, St. Paul & Kansas City.

Fort Worth & Rio Grande.—The old board of directors and the present officers were re-elected at the annual meeting in Fort Worth, Tex., April 6.

Gulf, Western Texas & Pacific.—At the annual meeting of the stockholders of the company, held in Victoria, Tex., April 6, the following board of directors was elected: C. P. Huntington, J. Kruttschnitt, A. Dacosta, W. G. Van Vleick, C. C. Gibbs, M. D. Monserratt and D. C. Porter.

Indianapolis, Logansport & Chicago.—The following officers were elected at a meeting of the Board of Directors in Logansport, Ind., April 4: President, E. N. Talbot; Vice-President, A. R. Shroyer; Treasurer, E. G. Comelings; Chief Engineer, Walter A. Osmer, and Secretary, C. H. Jeffries. The office of the company is at Logansport.

Memphis, Rogers & Western.—The following officers have been elected: J. A. C. Blackburn, President; S. B. Wing, Vice-President; W. C. Chynoweth, Secretary; W. R. Felker, Treasurer; R. H. Hillyard, Chief Engineer; R. G. Jenkins, General Manager, and J. M. Provins, Attorney. The office of the company is at Rogers, Ark.

Mount Carmel & Natalie.—The directors have elected the following officers: President, John McGinnis, Jr., New York City; Secretary, J. Gleason, New York City; Treasurer, J. C. Bailey, Philadelphia, and Chief Engineer, A. B. Cockran, Pottsville, Pa.

North Mexican Pacific.—J. Fewson Smith, of Salt Lake City, has been appointed Chief of Construction. The other officers of the company are the same as given March 9 under the title Mexican Pacific, which was the old name of the company.

Pennsboro, Harrisville & Glenville.—The incorporators met for organization in West Virginia last week, and elected the following officers: President and Treasurer, M. P. Kimball, Pennsboro, W. Va.; Vice-President, J. E. Taylor, Baltimore, and Secretary, ex-Governor W. H. Pierpoint. The directors are: M. P. Kimball, J. E. Tyler, J. M. Wilson, W. F. Harris and M. H. Tarleton.

Staten Island.—At the annual election of the Staten Island Railway Co., held at St. George, April 9, the following directors were elected: Erasmus Wiman, Charles Watrous, Charles H. Bass, J. H. F. Mayo, A. Horrmann, William King, L. Dejonge, C. A. Canavillo, E. P. Goodwin, J. W. Mersereau, N. Marsh, G. B. Ripley and G. F. Kreischer.

Tennessee Coal & Iron.—The stockholders elected the following Board of Directors at a meeting held in Philadelphia April 8: J. H. Inman, T. C. Platt, C. C. Baldwin, W. C. Sheldon, James Stillman, F. T. Brown, James T. Woodward, Samuel Thomas and A. B. Bird, of New York; Thomas Barrett, Napoleon Hill and Enoch Ensley, of Memphis; T. T. Hillman, of Birmingham, and N. Baxter, Jr., and A. M. Shook.

Tuscarora Valley.—The following are the directors of this new Pennsylvania company: T. S. Moorhead, J. Woods Brown, J. M. Caldwell, H. R. Frick, H. G. Cobill, Clarence G. Voris, J. P. McCleery and O. B. Krauser, all of Milton, Pa., and J. C. Moorhead, of Nanticoke, Pa.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Bridgeport & Decatur.—A contract has been closed with an Eastern firm to build the road from Bridgeport to Decatur, Tex., on the Fort Worth & Denver City, which has been surveyed by the Bridgeport Coal Co.

Brookline.—A bill is before the New Hampshire Legislature to charter the extension of this line to Brookline, N. H. Brookline is a town bordering on Massachusetts. The New Hampshire charter is for a road from near the centre of the town south about three miles to the state line. No complete survey has been made, and as yet there is no organization.

Burrard Inlet & Westminster Valley.—This company is applying to the Dominion parliament for power to construct a road from the international boundary, thence northwesterly to a point on the north side of the Fraser River, between Pitt River and Lulu Island, with a branch line to Burrard Inlet, B. C.

Calgary & Edmonton.—James Ross & Co., of Montreal, the contractors on this extension of the Canadian Pacific, expect to resume the grading by April 15, or soon after that date. The road is now graded from Calgary, on the Canadian Pacific, north to the Red Deer River, a distance of 93 miles. The line has been surveyed from the Red Deer River north to Edmonton, Alberta, and the grading will be pushed to completion during the summer. This section of 97 miles will probably be ready for operation early in the fall.

California & Nevada.—Tracklaying has been commenced for an extension from the present terminus northeast through Contra Costa County to Wagner and Walnut Creek, Cal., a distance of about 10 miles. The road is now in operation for about 20 miles northeast of Oakland, connecting with the Southern Pacific at Emery Station.

Cambridge & Chesapeake.—James Wallace, W. L. Henry and other citizens of Cambridge, Md., who have revived this project, have decided to incorporate the company under a legislative act which was passed in 1874. The capital stock will be \$50,000. The road is to be built from Cambridge, on the Philadelphia, Wilmington & Baltimore, south to a point on Chesapeake Bay, in the southern part of Dorchester County, Md. By the act of the Assembly under which the company will be incorporated, the County Commissioners are required to issue bonds to the amount of \$75,000 to the company as the work on the road progresses.

Canadian Pacific.—The contractors on the Souris Branch have received instructions to resume the grading at once on the extension of that line. The road was graded last year from Airdrie, the end of track, as far as Melita, Man., 27 miles, and the track will be immediately laid on this section. The grading will then be commenced on the extension westward from the latter point, and the road will probably be completed as far as Souris, 23 miles westward, this summer.

Castle Valley.—The company filed articles of incorporation in Utah this week. The capital stock is \$1,000,000. The estimated cost of the road is \$500,000, starts from Price Station on the Rio Grande Western, in Emery County, and extends westerly to Pittsburgh, in Cottonwood Canon. The distance is about 50 miles. The survey was made last fall for the entire line, but the company was not then incorporated. The road can be built with two per cent. grades. About 20 miles has been graded.

Chattanooga Lookout.—An incline road is being built from St. Elmo, a suburb of Chattanooga, Tenn., to a point on Lookout Mountain near the new hotel now building. The road is to be completed in time for the summer traffic. The grades are as high as 80 ft. per mile on some parts, the minimum being 14 ft. Frank C. Roberts, of Philadelphia, is the Chief Engineer.

Chicago, Kalamazoo & Saginaw.—Surveys have been made by the engineers of this company during the last few months for an extension from Kalamazoo southwest to Marcellus, Mich., a distance of 22 miles; and surveys have also been made for an extension northeast through Portland and Westphalia to St. Johns, a distance of 35 miles. The terminal points of both the proposed extensions are on divisions of the Grand Trunk. No contracts for the line have yet been let, and the work may not be awarded this summer. There will be little grading on the line except earthwork, and the only iron bridge will be one over the Grand River, 300 ft. long, on the line to St. Johns. The maximum grade of the extension will be 60 ft. per mile, and the maximum curvature three degrees.

Chicago North & South Elevated.—The company has filed a charter with the Secretary of State at Springfield, Ill. It is to build an elevated road in Chicago. The capital stock is \$10,000,000, and the incorporators are: J. Almon Austin, George C. Newberry, W. Epsser Cobb, Sam. T. White, William C. Goudy, John A. Doherty and Charles S. Thornton.

Chicago & South Side Rapid Transit.—The Chicago City Council adopted an ordinance on April 3 giving this company, which is generally known as the Alley elevated road, a right of way through Victor Place from Congress street to Twelfth street, Chicago. This brings the route into the centre of the business district, and close to the Auditorium Building.

Cincinnati, Wabash & Michigan.—A meeting of stockholders is to be held May 9, at which it is expected a formal transfer of the property to the Cleveland, Cincinnati, Chicago & St. Louis will be effected. The road is still operated independently, although the latter company has held control for several months, and several of its general officers hold corresponding positions on the line. The stockholders are to vote on the operating contract, and also on a proposed issue of \$4,000,000 of the four per cent. bonds of the controlling company, which will be secured by a mortgage on the Cincinnati, Wabash & Michigan.

Clear Lake & Northern.—The road has been graded for a distance of eight miles. A tunnel 2,800 ft. in length will have to be constructed, and, with the exception of that work, the grade will be a comparatively easy one. The road starts at Low Gap, about four miles above Ukiah, Cal., and follows the stage road very nearly by way of the Blue Lakes and Batcheller Valley to Lakeport.

Concord & Montreal.—When the company completes the branch from North Wear to Henniker, N. Y., it will commence the tracklaying on the line between Suncook and Candia, N. H., on the old Concord & Portsmouth road.

Delaware Terminal.—A bill was introduced in the Delaware Legislature this week to incorporate the company, with authority to build a road from Lewes to a point on the line of New Castle County and the State of Maryland. Among the incorporators named in the bill are Governor Reynolds, Speaker Sirman and Representatives Higgins, Morris and Ridgely.

Don & Senboro.—This company is applying for power to construct and operate a road to commence near the Don River, where it is crossed by Queen street, in Toronto, Ont.; thence extending easterly to the proposed Ashbridge Bay improvements; thence through East Toronto village to Victoria Park, in Scarborough, in York County; thence northerly to Boston's Corners, also in the town of Scarborough.

Duluth & Winnipeg.—The contractors have not yet begun much of the work on the proposed extension from Cloquet southeasterly to Duluth, Minn., but several trestles are being built across ravines for convenience during the grading. The line has been located from Cloquet as far as Short Line Park, about half way to Duluth, and the engineers are now making a locating survey for the balance of the line to West Duluth. When these lines are finished all the surveying will have been done, and the grading can be begun as soon as the contractors receive orders.

Egg Harbor & Island City.—Work will be commenced shortly on the Egg Harbor road, from the Camden & Atlantic junction to Gloucester Landing, N. J., a distance of seven miles. The road will be probably con-

tinued to Tuckerton. Most of the roadbed is already graded.

Fremont, Elkhorn & Missouri Valley.—Cody Bros., of Ogden, Utah, are reported to have the contract for an extension of this road, 100 miles in length, from its present terminus at Fort Caspar, Wyo., northwesterly to a point in the western part of Wyoming.

French Broad Valley.—The company has confessed judgments in favor of the sundry creditors to the amount of over \$23,000, and executions have been issued on the property of the company in Buncombe, Henderson and Transylvania counties, N. C. The directors have confessed judgment to the contractors, W. M. Cocke, Jr., the President, and Mr. Ramsour, the Chief Engineer.

Gainesville, Tallahassee & Western.—The company has about 200 men working on the grading near Tallahassee, Fla., north. The line has been located as far as Wacissa, Fla., near Monticello, and it is expected that the contracts for grading most of the uncompleted work between Tallahassee and Gainesville will be let shortly. The work now in progress is being done under the supervision of John M. Cook, the Chief Engineer.

Georgetown, Milton & Delaware Bay.—This company has been organized in Delaware to build a road from Georgetown south via Milton to a point near the mouth of the Broadkill River. The charter has been applied for, and the capital stock has been placed at \$250,000.

Georgia, Carolina & Northern.—The trains on the extension to Atlanta are now running to Beaver Dam, about seven miles west of the Savannah River. The station at Elberton, Ga., has been erected and the road will be in operation to that point, 15 miles beyond the Savannah River in a few days, as the track has been laid. The grading is practically finished as far as Athens, 30 miles west of Elberton.

Greenbrier & Gauley River.—The company has been chartered in West Virginia by Alexander McVeigh Miller, Enoch Smith, Henry Gilmer and others, to build a road from a point near Alderson to the Gauley River near the mouth of Cherry River. The authorized capital stock is \$2,000,000.

Indianapolis, Logansport & Chicago.—The articles of incorporation were filed in Indiana last week. The line is projected to form a new route between Indianapolis and Chicago, and is to be built from Indianapolis through Marion, Hamilton, Boone, Clinton, Howard and Cass counties. A. R. Shroyer and S. P. Sheerin, of Logansport, Ind., are incorporators.

Jefferson & Southwestern.—The company filed its charter in Texas last week, to build a road to extend from Jefferson, Tex., to some point on the line between Texas and Louisiana, near Wacoma, a distance of 26 miles. It will connect with the Texas & Pacific at the latter point. The capital stock of the company is \$300,000, which has been subscribed principally at Jefferson.

Jellico, Beattyville & Ashland.—This company has been chartered in Tennessee to build a road from Jellico via Barbourville and Manchester to Beattyville, and thence to Ashland, Ky. C. F. Davidson, of Barbourville, Ky., has been elected President. The office of the company will be at Barbourville.

Kettle Falls & Columbia Valley.—Preliminary surveys have been made by this company during the winter for a road from Kettle Falls through the Columbia Valley to the mouth of the Spokane River, through the Big Bend country to Wallula Junction to connect with the Union Pacific, and thence to a point on the Columbia River. Surveys are now being made at Kettle Falls. C. H. Morgan is Chief Engineer.

Kings County Elevated (Brooklyn).—An extension of the elevated structure of this road will soon be commenced. The extension will probably be from the present terminus at Eastern Parkway and Van Siclen avenue along the parkway to a point near the conduit line of the reservoir, north to Liberty avenue, and then east to the Brooklyn city line. The extension will be opened for traffic by Sept. 1.

Manitoulin & North Shore.—A. P. Kilganan, President of the road has received assurances from Sir John Macdonald of further aid toward this road, which will extend from the Algoma branch of the Canadian Pacific to Little Current, on the north shore of Manitoulin Island, Ont., 25 miles. Although the distance between Grand Manitoulin Island, in the north part of Lake Huron, and the mainland is nearly nine miles, a series of islands, which almost touch one another, will practically obviate engineering difficulties. The longest span is 450 ft., connecting Manitoulin Island with another island. The water in the channel at this point is only 3 ft. deep. The Ontario government has also voted a subsidy of \$3,000 per mile, and the officers claim that the work of construction will be commenced next month.

Memphis, Rogers & Western.—The survey for this road was commenced a few weeks ago, and the engineers have now completed the work for the first 20 miles from Rogers, Ark., southwest. It is proposed to build the road to Bald Knob, from which point the St. Louis, Iron Mountain & Southern extends directly to the Mississippi River, opposite Memphis. The distance is about 185 miles. The survey will be made through Benton, Madison, Newton, Searcy, Van Buren and Cleburne counties to Bald Knob, in White county.

Monterey & Mexican Gulf.—A bill is now before the Mexican Congress to grant this company a concession for an extension of its main line from the present northern terminus at Venadito, on the Mexican International road, to Sierra Mojada and to a point on the Mexican Central in the state of Chihuahua; also to connect with the North Mexican Pacific road to Topolobampo when that line shall be built. Another important privilege is to extend its line north from Monterey to the Rio Grande River. The government agrees to give a subsidy of \$8,000 per mile, payable in six per cent. bonds, which the company will receive at 90 per cent. face value. The extension into Chihuahua is part of a plan for military and commercial roads in Northern Mexico. The company may delay beginning work until 1893, but the subsidy bonds will not bear interest until 1894.

Nashville, Chattanooga & St. Louis.—Freight trains are running on the Tennessee & Coosa extension from Attalla to Albertville, Ala., 10 miles east of Guntersville, on the Tennessee River. The track is now laid to within six miles of Guntersville, and the end of track is on Sand Mountain, where the road starts to descend the mountain to Guntersville. The descent of the

mountain on the western slope is very rough, and will require several deep cuts and high trestles, but the work, since the fair weather began, has progressed rapidly.

New Albany Belt & Terminal.—The road will be completed by May 1 between New Albany, Ind., and the connection with the tracks of the Kentucky & Indiana Bridge Co., on the north side of the Ohio River opposite Louisville. The road follows the Ohio River, and is 10 miles long.

New Roads.—Public meetings have been held at towns and villages interested in a project for building a road from Syracuse, N. Y., southeasterly about 80 miles to Deposit Station, on the Erie Railroad. The new road would run through the following towns: Pompey and Fabius, Onondaga County; Cuyler, Cortland County; Lincklaen, Pharsalia and Oxford, Chenango County; Fenton, Colesville and Sanford, Broome County.

About \$75,000 has been subscribed by the citizens of Victoria County, Tex., for the capital stock of a company which is to be incorporated to build a road from the town of Victoria southeast to deep water on the Gulf of Mexico, and possibly toward some point north.

John Macklen & Co., Macon, Ga., have the contract to build a road 35 miles long between Newberry and Allendale, S. C., connecting at the latter place with the Blackville, Alston & Newberry which is completed to Barnwell, 20 miles.

The Board of Trade, of Dublin, Tex., is interested in a project to organize a company to secure right of way and to grade a road from Dublin south to Carlton, 20 miles, and Hamilton, 30 miles, and possibly also to Lampassas, about 40 miles further south. It is proposed to transfer the graded roadbed to one of the Texas roads for completion and operation.

J. K. De Remer, of Trinidad, Col., has contracted to build a road from the Thompson mines to La Junta, near Trinidad, if the right of way is secured by the Chamber of Commerce.

Norfolk, Albemarle & Atlantic.—The consolidation of the Norfolk & Virginia Beach and Danville & Seaboard, was formally ratified at a meeting of the stockholders of the reorganized company in Norfolk, Va., last week. It was also voted to begin the work of changing the road to standard gauge before June, and to issue bonds to construct the extension from Jackson's, on the main line, south to Albemarle Sound.

Norfolk & Western.—The double track on the New River division between Graham and Bluefield to Bluestone Junction, Va., 10 miles, has been recently put in operation.

Resident Engineer Hitchcock, at Wayne Court House, W. Va., states that the grading for the line up the Twelve Pole River Valley will be commenced May 1, and that it is expected to have the track laid by July 1.

Northern Pacific.—Smith & Wilson, the sub-contractors on the Chehalis & South Bend road have a force of men clearing the right of way on the Chehalis end of the line. Feeney & McAuley have a sub-contract on the Chehalis River bridge. Webster, Kelso & Dare also have a force at work. About 500 men will be employed on the Chehalis end as soon as the weather clears so that that number can be worked to advantage. The bridge across the Chehalis is delaying the work now, but just as soon as it is completed railroad building will be pushed as fast as possible.

North Mexican Pacific.—The contracts for the grading and tracklaying on the first 50 miles of the road from Deming, N. M., are being let. Some grading has already been completed on this section. The location is being made in north Mexico. The general route of the road has already been given, but the following account gives a more detailed description: From Deming the line passes south through the newly organized city of Columbus, immediately north of the international boundary line, 35 miles from Deming. From this point the general course is southerly to the city of Guerrero, passing through Palomas, Colonia Diaz, Ascension, Corralitos, Casas Grandes, Colonia Dublan, Galeana, El Valle, Cruces, Namiopulpa, Santa Ana, Manzana and Santo Tomas. The distance from the international boundary line to Ciudad Guerrero is 225 miles. From Guerrero the general course of the projected road is southwesterly, passing the Sierra Madre range to Topolobampo Bay. This portion of the line is not yet surveyed, consequently the distance is not determined. A branch line will extend from Guerrero east to the city of Chihuahua, connecting with the Mexican Central, an estimated distance of 120 miles, and another is proposed from Topolobampo to Guaymas. Besides these two branch lines others are projected to extend from the main line to important points of mining and commercial importance.

Pennsylvania & Northwestern.—In order to provide funds for improvements, the stockholders of the company voted to increase the capital stock from \$1,000,000 to \$2,000,000 at a meeting in Philadelphia, April 8.

Port Townsend Southern.—Altogether about 500 men are at work on the road between Port Townsend, Wash., and Quilcene. There are four camps on the first 20 miles to Hooker's Lake, the men being engaged in surfacing and ballasting the track. The damage from the washouts has been repaired, 10 miles of surfacing has been done, and in a few weeks the track will be ready for operation. The workmen will then be transferred to the Quilcene end of the road, where three gangs are already at work, clearing and grading the right of way. It is expected that the road will be open to Quilcene by July 1.

Quebec Central.—The meeting of the shareholders and income bondholders which, as already announced, will be held in London May 5, has been called to vote on a resolution authorizing the construction of a branch starting from a point on the present line between Beauce Station and Tring Junction, Que., and extending to a connection with the Atlantic & Northwestern at Lake Megantic, near the Maine state line. The directors propose to build this branch instead of completing the Chaudiere Valley extension from St. Francois through Beauce County, Que.

Red River & Southwestern.—Murphy, Burkett & Co., of Taylor, Tex., have been awarded the contract for building the first section of the road from Henrietta, on the Missouri, Kansas & Texas, southwest to Archer, Tex. The grading is to be completed before June. The locating survey of the line has been made for a distance of 20 miles to near Archer, and the preliminary surveys have been run south of Archer toward Abilene on the Texas & Pacific.

Roanoke & Southern.—The road will be opened for traffic as far as Martinsville, Va., about April 15, from

Winston, N. C., the southern terminus. The distance is about 60 miles. The line is also under contract between Martinsville and Roanoke, Va., a distance of 60 miles.

Sault Ste. Marie & Southwestern.—The control of this road will be transferred this month to the Chicago, St. Paul, Minneapolis & Omaha, which recently purchased the line. It guarantees the bonds of the company to the extent of \$400,000, but the other terms of the sale are not known. The road now extends from Fairchild, on the main line of the Omaha between St. Paul and Chicago, westerly to Mondovi, Wis., a distance of 37 miles, and it is reported that an extension will be built to the Ellsworth branch of the Omaha.

Seattle, Lake Seattle & Eastern.—The contractors have about 300 men working on the last 17 miles of the northern branch near the international boundary. All the track has been laid, 23 miles of the distance being completed this year, between the 79th and 102d miles, from Woodinville Junction, Wash. There are about 200 men working on the track on the last 17 miles ballasting and surfacing, and 100 men are finishing the bridges. The route of the branch is from Woodinville (Snohomish) Junction, 24 miles from Seattle, nearly due north to the international boundary, passing through Snohomish City; along the east shore of Lake Cassidy; crossing the Shillagumish River just below the forks; along the west side of McMurray's Lake; along the east shore of Big Lake; between Mud and Clear lakes; crossing the Skagit River just west of Sedro P. O.; crossing the south fork of the Nooksack River west of Acme P. O.; along just east of the south fork of the Nooksack River, crossing the north fork of the Nooksack River at the junction with the south fork; along the Nooksack River to opposite Nooksack P. O.; down the Sumas River to the boundary; passing through Nooksack and Sumas cities.

Seattle & Montana.—The company has nearly 900 men finishing the grading and bridging between Seattle and the junction of the Fairhaven & Southern. Shepard, Henry & Co., whose headquarters are now in the Haller Block, Seattle, have the contract for grading on the 80 miles between Seattle and the junction with the Fairhaven & Southern. They expect to complete their work soon after April 15. The contract for the tracklaying will be let in a few days, and if the work is not delayed trains will probably be running in June. Nearly all the bridges on the line are finished. The bridge over the Skagit River near Mt. Vernon is ready for the rails, and also those over the Ebey Slough, at the mouth of the Snohomish River, and across Salmon Bay, near Ballard. The structure over the Stillaguamish River will be finished in about two weeks. The road follows the shore of Puget Sound from Salmon Bay, near Seattle, north to Marysville, on the Snohomish River. North of Marysville the route leaves the coast, and extends inland, passing east of Stanwood and Skagit, through Mt. Vernon to its northern terminus. Log cribbing has been built on the 40 miles of the road which is along the coast of Puget Sound. The maximum grade on the line is 20 ft. per mile, and the maximum curve is six degrees.

Seattle & Northern.—A contract has been recently let for grading a branch from the main line to mines about six miles distant at Bennett, Wash.

Sedalia, Warsaw & Southwestern.—The charter of this company was granted in Missouri this week. The capital stock is \$1,000,000. The road is a reorganization of the Sedalia & Warsaw, a narrow-gauge branch of the Missouri Pacific. It will be changed to standard gauge. The incorporators are George J. Gould, S. H. H. Clark, George C. Smith, C. S. Grinley and B. E. S. Merriam.

Southern Pacific.—The surveyors have completed the location for the new line at Yuma, Ariz., which is to be built along the Mesa River further north of the town than the present line, and above flood height. The construction will begin at once.

Texas, Louisiana & Eastern.—The charter of this company was filed in Texas last week. The capital stock is \$400,000. The road which the company proposes to build will extend from Monroe, in Montgomery County, Tex., to some point in Liberty County, a distance of 40 miles.

Toledo, Columbus & Cincinnati.—The last of the track on the extension from Kenton to Ridgeway, O., to connect with the Cleveland, Cincinnati, Chicago & St. Louis, has been laid and the connections at the terminus completed. The line is about eight miles long, and trains will begin running over it shortly.

Trenton Cut-Off.—The work of tracklaying on that section of the Pennsylvania Trenton extension between Morrisville, Pa., and the Schuylkill River is rapidly approaching completion. The rails are now laid from Morrisville, on the east, to a point near the Montgomery county line. From the Schuylkill River the rails are laid eastward to a point near Willow Grove, leaving a gap still to be covered of about seven miles. The work of grading west of the Schuylkill is expected to be completed to Glen Loch, on the main line, in about six or eight weeks.

Tuscarora Valley.—The company filed its charter in Pennsylvania this week. It proposes to build a road 15 miles long from a point in Milford township to a point in Lock township, all in Juniata County, Pa. The capital stock is \$150,000. T. S. Moorhead, Milford, Pa., is President.

West Virginia Central.—The annual meeting was held in Philadelphia last week. Mr. Alexander Boudron, the President, says that it was then decided to commence the grading on the line shortly, and that the arrangements for completing the first division of the line will be made shortly.

West Virginia Central & Pittsburgh.—The work on the proposed extension to the Grafton & Greenbrier road at Bealington, W. Va., has not yet progressed far enough to begin grading, as it was recently stated had been done. The engineers are locating the line, but no route has yet been selected. The surveys have been made from Elkins, on the main line, and the distance from that point southwest to Bealington is about 45 miles.

Wilkesbarre & Western.—The engineers of this company are surveying a line from the main road at Wapwallopen to connect with the Lehigh Valley at White Haven, and it is expected that the road will be constructed during the present year.

Wisconsin Central.—The officers state that it is not proposed to build the branch from Oshkosh to Montello, Wis., nor is it contemplated to have any surveys made for the line at present, as recently reported.

GENERAL RAILROAD NEWS.

Boston & Lowell.—The bill permitting the corporation to increase its capital stock passed the Massachusetts Legislature this week.

Central Counties.—Ground was broken at Glen Robertson on the Canada Atlantic, in Glengarry county, Ont., last week, for this road, which will extend northeast across the county to Vankleek Hill and Caledonia Springs in Prescott county, on the Vaudreuil & Ottawa road. Work will be pushed rapidly. The line will be about 20 miles long.

Chesapeake, Ohio & Southwestern.—The purchase of the Ohio Valley road, extending from the Ohio River at Evansville, Ind., south to Princeton, Ky., 100 miles, was ratified at a meeting of the stockholders in Memphis, Tenn., last week.

Chicago, Burlington & Quincy.—The annual report, issued this week, gives the following statement of the operations: Gross earnings were \$27,725,936; operating expenses, \$17,538,455; taxes, \$1,231,243; rentals, \$206,077; interest on bonds, \$5,491,992; sinking fund, \$765,492; total, \$25,193,261; leaving net earnings of \$2,532,704; interest and dividends received, \$806,034; net land receipts, \$178,154; total, \$3,517,194; dividends paid, 3 per cent., \$3,819,630; deficit, \$302,435; capital, \$76,394,505; debts, \$111,459,482. The outside system of a little over 1,300 miles shows but slight change in mileage for some years, as the Chicago, Burlington & Northern has not yet been included. The Chicago, Burlington & Quincy owns all the stocks covering these lines, and of the debts of the properties the company owns all but \$16,858,000, against \$17,171,000 outstanding a year ago. Gross earnings of these lines were \$7,404,619; operating expenses and taxes, \$5,356,705; net earnings, \$2,047,914; other income, \$80,117; total net, \$2,128,031; charges, \$1,449,735; surplus, \$658,296; paid C. B. & O., \$610,083; net surplus, \$48,213.

Cincinnati, Hamilton & Dayton.—A meeting of the stockholders has been called, to be held in Cincinnati, O., April 27, to vote on a proposed lease of the Cincinnati, Dayton & Ironton for 99 years. The lessee is to guarantee the payment of principal and interest of the bonds of the lessor, which amount to \$3,500,000 and bear five per cent. interest.

Concord.—The New Hampshire Supreme Court replying to the resolutions of the House of Representatives requiring the opinion of the court on the right of the state to purchase the Concord road, says: "That property is no exception to the rule that private property may be taken for public use on payment of its value to its owners, and the property in question cannot be purchased or taken by the State for less than its value without the owner's consent." When the road was chartered a clause was inserted giving the state the right to purchase the property. When Mr. Austin Corbin renewed his offer to purchase the state's interest in the road, it was asserted that the state had lost its right of purchase by the act consolidating the Boston, Concord & Montreal and the Concord, which was passed by both houses of the legislature. That act does not make any reference to the state having any right of purchase. No action will be taken on Mr. Corbin's offer.

Gettysburg & Harrisburg.—It is reported that the Pennsylvania has closed a contract with this company, which operates a road between Gettysburg and Harrisburg Junction, 35 miles, for the use of the latter's line. This arrangement includes the control of the branch from Hunter's Run to Pine Grove, Pa. By this move the Pennsylvania will debar the Philadelphia & Reading from privileges it might have secured from the road which the new Reading extension crosses up the Cumberland Valley at Mt. Holly Springs.

Long Island.—An important change in the ownership of the capital stock was announced this week. J. Rogers Maxwell, Vice-President of the road and President of the Central of New Jersey, Henry W. Maxwell and Henry Graves, who together have controlled one of the largest interests of the stock, have sold their shares to Austin Corbin and Charles Pratt, of Brooklyn. Mr. Pratt will become a director, and the two other vacancies will be filled at the annual meeting last week.

Morristown & Cumberland Gap.—The stockholders held a meeting at Morristown, Tenn., this week, at which the action of the directors, taken Feb. 2, in voting to issue first mortgage bonds to the amount of \$1,000,000, was ratified. The bonds are to bear six per cent. interest, and will be payable in 30 years.

St. Louis & San Francisco.—The Atchison, Topeka & Santa Fe has issued a circular to the first preferred stockholders of the St. Louis & San Francisco, in which it announces that to provide for certain deficiencies, which are given in detail, and to place this company and its properties in sound financial and physical condition, it has been decided to issue a new consolidated 4 per cent. bond covering all of the properties, equipment and lands of the St. Louis & San Francisco, amounting to \$50,000,000, subject only to prior liens of present outstanding mortgages, securing bonds which will be gradually retired by the operation of their respective sinking funds and maturities, and be replaced by the new bonds. The circular says: "The present total outstanding direct mortgage bond issues of the St. Louis & San Francisco on its own and leased lines is \$36,077,500. This will leave \$13,922,500 new consolidated four per cent. gold bonds available for the following purposes: To provide for retirement of \$2,800,000 Atlantic & Pacific second mortgage six per cent. bonds, guaranteed both for principal and interest by the St. Louis & San Francisco; to provide proper facilities and equipment; to pay the floating debt of the company; provide the treasury with cash resources. The Atchison will offer \$4,500,000 of the new bonds of the St. Louis & San Francisco to the holders of that company's first preferred stock on a basis of exchange of par for par."

South Lyons & Northern.—The track on this branch between Lelands and South Lyons, Mich., eight miles, was taken up during one of the nights of last week. The line was built by the Toledo, Ann Arbor & North Michigan to give it a connection with the Grand Trunk at South Lyons, but what was considered a more desirable connection was made later west of that town, and the branch became unprofitable. Last fall the line was sold to a new company organized to build from Lelands to Pontiac and Flint. That company did no grading, and the project was abandoned. Few trains have been run, and the State Railroad Commissioners were applied to to issue an order for the repair of the road and an increase of freight service. The farmers who made the complaint claim to have subscribed \$1,000 a mile for the

road. The order they asked for was not issued, and, as stated, the rails were removed by the company. Proceedings have been begun to compel the company to replace them. The Ann Arbor & North Michigan claims that it was not concerned in tearing up the track and has had no interest in the line since it was sold last fall. It is claimed that the object of organizing the new company was to relieve the Ann Arbor road from legal responsibility.

TRAFFIC.

Chicago Traffic Matters.

CHICAGO, April 8, 1891.

The northern lines have agreed to the basis of lake and rail rates adopted at the New York meeting and the outlook for the season is much more encouraging than it was a year ago. The basis adopted was as follows:

New York to St. Paul:	1	2	3	4	5	6
Via Chicago:	1.11	91	75	50	42	37
Via Lake Superior and Gladstone:	1.01	86	69	46	38	34

This basis was adopted after an understanding had been reached that the Chicago lines would put in effect advances to interior points in Minnesota and Dakota on a basis of \$1.15 first-class to Watertown, N. D., an advance of 15 cents. The rate clerks met here Monday for the purpose of checking up the rates in accordance with the above basis.

The Chicago-Missouri River lines have agreed to an arrangement substantially the same as last year on lake and rail rates from east Mississippi River points, St. Louis to Dubuque inclusive, to be used as proportions on business originating at points beyond the Mississippi River. These rates to New York are 72, 62½, 48, 35½, 30, 24, with the usual differentials to other eastern and seaboard points. The lines decided to charge the same proportion of these rates eastbound on lake and rail traffic as they do on business by rail. Westbound rates are on a basis of 75 cents for first class. The arrangement became effective April 15. Business from eastern territory to points west of points on the west bank of the Mississippi River, carried in connection with the lake lines, is to take the established local rates.

The western lines are divided as to action in regard to the payment of commissions in trunk and central territory, and many of them are inclined to view the action of the trunk lines with some suspicion; and there is likely to be considerable of a row before the matter is amicably settled. The Burlington continues paying commissions, and it is reported from Omaha that the Union Pacific has given instructions to resume the payment of commissions in eastern territory.

Chairman Finley has adjudged the Burlington guilty of a violation of the association agreement in selling certain tickets from Council Bluffs to Fulton and Clinton, Ia., at less than established rates.

The veto of the maxim rate bill in Nebraska encourages the western lines to believe that at last the more conservative and intelligent element are beginning to recognize the fact that hostile legislation of this kind can only result in disaster to the interests of the State.

The Chicago roads have agreed that all fast freight line commercial and local freight offices be closed at 2 p. m. on Saturday from April 30 to Oct. 30.

The Chicago lines have been considering the matter of the manipulation of scalpers of rates on tickets from Council Bluffs to Mineral Point, Wis., via Chicago, and in order to put a stop to it have adopted a resolution that Omaha and Council Bluffs agents be instructed to limit all tickets via Chicago to northern Illinois and Wisconsin points to one day from the date of sale.

Traffic Notes.

The name of the freight bureau at St. Louis is to be the "St. Louis Traffic Commission." W. E. Schweppe is President, and L. B. Tebbetts is First Vice-President.

The Toledo, St. Louis & Kansas City will, on May 1, put on through night passenger trains each way between Toledo and St. Louis.

The Western & Atlantic, after a trial of 2-cent passenger rates, announces a resumption of the former tariff, based on 3 cents a mile.

The Colorado-Utah Traffic Association has been reorganized. P. J. Flynn is Commissioner, with headquarters in Denver.

After a membership of a week the Jacksonville Southeastern has sent notice to Chairman Finley of withdrawal from the Western Passenger Association. No explanation was sent with the notice, nor has any explanation yet been sent to the Atchison.

The Nebraska Bill Killed.

Gov. Boyd vetoed the Maximum Freight-Rate bill, recently passed by the Nebraska Legislature, on the ground that it was unconstitutional. The lower house promptly passed the bill over the Governor's veto, but in the Senate, after a long struggle, the veto was sustained by a vote of 18 to 13.

Particulars of Eastbound Shipments in 1888, 1889, and 1890.

In General John McNulta's argument before the Senate Committee on Interstate Commerce during the recent hearing on Canadian competition with American roads, which has been printed for the committee, are given interesting statistics of some of the eastbound shipments out of Chicago. From Dec. 23, 1889, to Oct. 25, 1890, there were shipped from Chicago to New England 19,137 carloads of dressed beef divided as follows:

Roads:	Cars.	Per cent.
Chicago & Grand Trunk:	7,715	40.3
Michigan Central:	2,318	12.1
Lake Shore & Michigan Southern:	1,700	8.9
Pittsburgh, Ft. Wayne & Chicago:	318	1.7
Chicago & Erie:	238	1.4
Chicago, St. Louis & Pittsburgh:	1,231	6.4
Wabash:	5,397	29.2
Total:	19,137	100.0

Gen. McNulta remarked: "Taking shipments by the Wabash 29.2 per cent., and the Chicago & Grand Trunk 40.3 per cent., will make 69½ per cent. by these two routes. Say one-half of the Wabash shipments finally reached American trunk lines, this would give in round figures 55 per cent. of the dressed beef business as having gone through Canada to reach New England."

Out of a total of 46,873 cars of dressed beef shipped from and through Chicago to all points for the first ten months of the year (1890), Messrs. Armour, Morris, Swift and Hammond, the "big four," shipped 45,692, leaving 1,181 cars shipped by other parties. The proportion shipped by each shipper is not obtainable. Of this total 19,137 cars went to New England points. Of the total cars, the Chicago & Grand Trunk had 22.9 per cent., the Wabash 14.2 per cent.

The report of the Union Stock Yards gives the following amount of live stock shipped eastward from Chicago during 1889:

NUMBER OF ANIMALS.

	Cattle.	Calves.	Hogs.	Sheep.	Horses.	Total No. of cars.
Balt. & O.	102,336	762	133,973	79,469	3,166	7,819
Chi. & Erie	24,481	223	4,436	16,070	3,357	1,063
Chic. & Gd.	74,990	170	1,057,645	3,569	1,980	17,057
Trunk:	162,779	3,746	438,818	254,864	40,966	18,486
Lake Shore	225,736	835	49,494	62,362	2,282	14,747
Mich. Cen.	275,003	41,716	87,833	93,654	783	18,031
Nickel Plate	24,446	255	3,139	18,186	1,715	1,483
P. C. & C.	242,768	9,438	193,016	200,373	32,428	17,312
St. L.	9,250	11	968	2,611	337	529
Wabash:	1,141,729	57,129	1,969,322	731,069	87,034	97,127

The number of carloads of live stock and dressed beef east from Chicago is greater than the number of carloads of grain shipped by rail from that city to the seaboard.

DESTINATION OF SALT MEATS IN 1890.

Shipped from Chicago by:	Canada.	Boston.	Port'd.	Balto.	Phila.	N. Y.	Misc.	Total tons.
Balto. & Ohio:				25,649	6,216	3,945	1,243	37,053
Ch. & G. Trunk:	28,318	13,209	10,261		1,102	2,587		55,477
Lake Shore:		15,775	4	293	3,084	31,543	2,388	53,087
Mich. Cen.:	7,159	32,779	180	785	1,901	56,400	197	99,401
N. Y., Chic. & St. L.:		6,786	32		9,293	21,211	337	37,328
Ft. Wayne:		1,102		7,507	21,937	10,510	13,207	54,353
P. C. & C. & St. L.:		290		4,295	4,956	2,444	3,407	15,582

Cities named include common points. "Salt meats" include all kinds of dried, salted, canned or bulk meats.

FLOUR, GRAIN AND LARD FROM CHICAGO, IN TONS, 1888.

	B. & O.	C. & G. T.	C. & P.	L. S. & M.	Mich. Cen.	N. Y. C. & St. L.	P. C. & C.	W. & A.	Total.
Flour:	35,595	26,633	53,968	30,054	36,714	21,238	92,612	30,281	300,281
Grain:	104,944	203,618	69,385	137,013	171,581	110,198	95,937	896,876	1,869,542
Lard:	11,893	13,785	10,068	25,215	9,640	8,528	8,977	89,372	189,509

1889.

Flour:	25,968	20,168	12,816	19,293	15,986	16,619	48,006	159,450
Grain:	89,516	192,657	83,947	126,652	109,766	92,702	107,711	872,952
Lard:	21,261	15,282	5,960	18,863	33,558	15,779	11,985	122,678

EXPORT AND DOMESTIC FREIGHT IN TONS FROM CHICAGO TO TRUNK LINES AND EAST THEREOF, 1888.

	For export.	Per cent.	Domestic.	Per cent.	Total.	Per cent. of export to whole tonnage.	Per cent. of domestic to aggregate tonnage.	Total per cent. of aggregate tons carried.
B. & O.	57,591	16.1	225,370	11.3	283,961	20.3	79.7	12.1
C. & G. T.	49,242	13.7	351,409	17.5	400,651	12.3	87.7	17.7
C. & P.	57,887	16.1	160,571	8.	218,458	25.5	73.5	9.2
L. S. & M. S.	50,760	14.1	348,270	17.4	399,036	13.4	86.6	15.9
Mich. Cen.	50,341	14.	325,464	16.2	375,808	7.1	92.9	9.4
N. Y. C. & St. L.	15,710	4.4	246,828	12.3	262,538	16.6	83.4	18.9
P. C. & C.	74,381	20.7	373,119	18.6	447,500	18.4	81.6	7.
C. L. St. L. & C.	3,055	.9	13,590	.7	16,645			
Total tons:	339,000		2,005,627		2,364,627			

1889.

B. & O.	60,376	12.2	277,147	13.0	337,523	17.9	82.1	13.7
C. & G. T.	82,725	19.9	390,718	16.5	473,443	19.1	80.9	17.6
C. & P.	29,489	6.9	151,026	7.1	180,515	15.3	84.7	7.4
L. S. & M. S.	28,399	6.5	356,069	16.7	384,468	7.4	92.6	15.6
Mich. Cen.	74,112	17.3	376,876	17.7	450,988	16.0	84.0	18.3
N. Y. C. & St. L.	16,605	5.	246,397	9.6	262,002	7.	93.0	9.
P. C. & C.	40,181	9.2	413,212	19.4	453,393	8.9	91.1	18.4
Total tons:	332,189		2,130,475		2,462,664			

East-Bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, April 4, amounted to 76,654 tons, against 82,193 tons during the preceding week, a decrease of 5,539 tons, and against 70,830 for the corresponding week of 1890, an increase of 5,824 tons. The proportions carried by each road were:

	Tons.	P. c.	Tons.	P. c.
Michigan Central:	10,286	13.4	10,223	12.4
Wabash:	4,652	6.1	5,154	6.3
Lake Shore & Michigan South:	8,409	11.0	10,217	14.4
Pitts., Ft. Wayne & Chicago:	5,995	7.8	7,422	9.0
Chicago, St. Louis & Pitts.:	9,034	11.8	9,275	11.3
Baltimore & Ohio:	3,726	4.8	3,400	4.2
Chicago & Grand Trunk:	12,252	17.3	12,826	15.6
New York, Chic. & St. Louis:	12,276	16.0	12,395	15.1
Chicago & Atlantic:	9,044	11.0	11,218	13.7
Total:	76,654	100.0	82,193	100.0

Of the above shipments 4,078 tons were flour, 41,085 tons grain, 5,957 tons cured meats, 3,041 tons lard, 7,458 tons dressed beef, 1,119 tons butter, 992 tons hides, 113 tons wool and 8,176 tons lumber. The three Vanderbilt lines together carried 40.4 per cent., while the two Pennsylvania lines carried but 19.6 per cent.